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VIEWS, NEWS AND INTERVIEWS.

Mr. Alexander Siemens, in his inaugural presidential address to the Institution of Electrical Engineers, London, used these as his opening words:

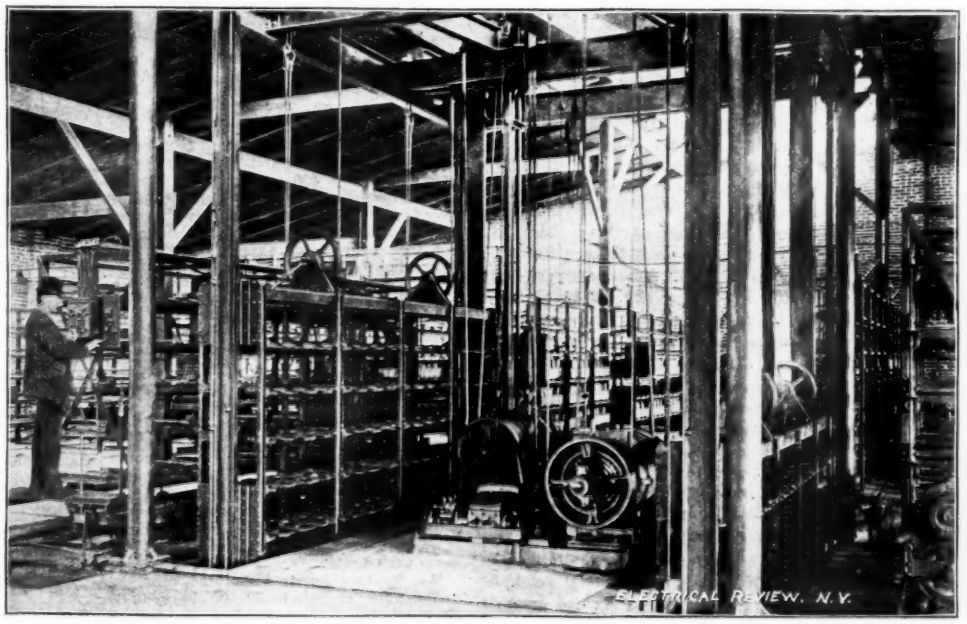
"In taking this chair, and in thanking you sincerely for having elected me to be your president during this year, it is only natural that I should remind you of the fact that the late Sir Wm. Siemens was your first president. For this reason I may claim to be the first representative of the second generation of electrical engineers who have been called into separate existence by the founding of this Institution 22 years ago."

In the show window of an optician's shop on Tremont street, Boston, is a line of compasses which perform gyrations marvelous to the lay mind, and which incidently, afford an attractive and mysterious advertisement for the proprietor. They are to all appearances not connected with ary source of motion, and yet the needles move all the time from right to left, and sometimes swing quite around the circle of their little boxes. The reason is that the return current from the trolley lines on Tremont street exerts an attraction on the compass needles and causes the mysterious motions.

Trolley cars have been plying between Yonkers and Mount Vernon, N. Y., for the past four or five months. They superseded an antiquated stage line which made the journey over the hills and dales that lie between the rival townships both expensive and uncomfortable. The fare was 25 cents. The trolley company charge five cents over some three and one-half miles of the road, and an additional five cents for riding over the remaining 300 feet of the line. The Bronx River, which flows some 300 feet west of Mount Vernon, is the dividing line. The division is so ridiculously unequal, that no patron of the road has ever been known to pay the company 10 cents for his transportation after he discovered that he could halve the expense by walking these 300 feet.

At the annual meeting of the Troy and Albany, N. Y., Steamboat Company it was decided to purchase two new boats to be used next season. The crafts will be propelled by electricity. They will be 50 feet long and 14 feet wide. The boats will have a speed of from 10 to 12 miles an hour, and will accommodate 35 people. The steamboat company think they will prove a success.

The Dedham, Mass., Electric Light Company is engaged in putting in an electric police signal between Dedham Centre and East Dedham. The system of signaling will be original. Set high upon a post in Memorial Square, Dedham Centre, at the extreme joint of a wooden arm, is an incandescent lamp, bright red in color, and set upon a post in Boyden Square, East Dedham, is a similar device. When the night police of either section desire the aid of the police of the other section, all that is needed is to turn a switch, which turns the light on in the globe and attracts the attention of the policemen in another part of the town and lets them know they are wanted.



STORAGE BATTERY TRACTION AT WASHINGTON, D. C.—A CORNER IN THE ACCUMULATOR ROOM OF THE METROPOLITAN RAILROAD.

Henry Miller, of St. Louis, is in town, and a very busy man, according to the New York *Morning Advertiser*. Mr. Miller is Grand Organizer of the Brotherhood of Electrical Workers, and has a strong opinion that restoring harmony among the local electrical unions is more difficult than reinstating Queen "Lil" upon the throne. The electrical unions of New York and Brooklyn at present are in a state of ferment, each claiming that the other is not a *bona fide* union organization. More than a mere technicality is involved, and the probability is that the trouble, if not at once settled, will create disaffection among a large number of trades unions in the twin cities. Mr. Miller is working diligently toward effecting a compromise.

Kalamazoo, Mich., will put in a $45,000 electric light plant.

Prof. Dewar and His Experiments.

Prof. C. Dewar is making steady progress in his wonderful discoveries as to the effects of low temperature, says the New York *Sun's* London correspondent. He gave the results of his latest experiments in a lecture before the Royal Institution recently. The table was covered with many flagons of liquefied air enveloped in carbonic acid snow. He said he had proved that at absolute zero all metals have the same degree of conductivity to electricity, however much they may differ at higher temperatures. Prof. Gladstone's theory of refractive indices of gases had been perfectly confirmed. He found that a low temperature greatly increased the strength of metals. Iron at — 180 degrees centigrade had twice the cohesive power it possesses at an ordinary temperature.

A fully saturated magnet was found to have its power greatly increased by a reduction to — 180 centigrade. Intense cold has a strange effect on color. The professor sponged a scarlet card painted with iodine with liquefied air, and the brilliant scarlet changed to orange, but recovered its original hue immediately after it became warm again.

Many brilliant experiments were made by sending electric discharges through exhausted glass globes. All the well-known phenomena of phosphorescence ceased as soon as intense cold was applied. The electricity tried to pass by any route rather than through the globe. What did this mean? asked the Professor. Obviously that something was now frozen out which had before enabled electricity to pass across the vacuous space.

STORAGE BATTERY TRACTION AT WASHINGTON, D. C.

A CAREFUL TEST PROVES THE BATTERIES TOO HEAVY—A TRACK WITH MANY GRADES AND SHARP CURVES—STORAGE BATTERIES THE ONLY POWER AVAILABLE—NINE STYLES OF ACCUMULATORS TRIED—AN EXPENSIVE EXPERIMENT—FAILURE THE FINAL VERDICT.

BY GEORGE C. MAYNARD.

Storage batteries have been weighed in the balance and found—*too heavy*. An honest man held the scales. Geo. W. Pearson is one of the best all-round street railway men in the United States. For nine years he has been president and active manager of the Metropolitan Railway in Washington, D. C. During that period the necessity and the possibility of procuring a substitute for horse-power for the propulsion of street cars has been one of the most important and pressing subjects he has had to consider, and he has given it the most careful and thorough study. Every known method has been investigated. These investigations led Mr. Pearson to a belief in the truth which everybody realizes and all disinterested persons admit, that the ideal motor is one which will make every car independent of all the others.

The Metropolitan Railroad (not counting several branches) is a double track road five and one-half miles long. It begins on the hills above Georgetown and ends in the eastern section of the city, a mile beyond the Capitol. It runs through the principal business and residence sections of the city, and passes the Capitol and eight of the principal government buildings. The travel on the line is irregular, and at times exceedingly heavy. There is not a hundred feet of level track in the whole road. The grades range from two and one-half to five per cent., and there are 42 curves, many of them very sharp. The sharpest curves are on the heaviest grades.

The use of a cable under such conditions was manifestly impracticable; the trolley sys-

tem was prohibited by public opinion and a law of Congress; steam was out of the question; the proposition to use compressed air was an intangible scheme. On March 5, 1889, a special act of Congress declared that the use of horses should cease two years thereafter.

These facts pointed to storage batteries as most likely to furnish available power. Out of 10 chaotic years of bitter contests and wasteful litigation over the rights of rival claimants to the invention, there came fair prospect of commercial utility, backed by strong assurances from men of good judgment and sincere purpose. Some of the most competent electrical engineers in the country unhesitatingly declared their conviction that street railways could be successfully and economically operated by this system.

In the Summer of 1889 Mr. Pearson and his associates determined not to add one more to the long list of trifling experiments, but to operate their road with storage battery cars if it were possible. At the outset they engaged the services of the well-known electrical engineer, Mr. C. O. Mailloux, of New York, who had made a special study of accumulators ever since their introduction, to design a suitable plant and superintend its construction and operation. With him came Mr. F. H. Chamberlain, a practical electrical expert who had had a long and varied experience in work of this character. He has had charge of the Metropolitan power house and all the details of the work during the entire time it has been going on.

In the course of four months after the undertaking was started the first car was put on the road. Experimental trips were made at night after the day's traffic was done. With a fair load of the company's officers and directors a speed of 15 miles an hour over the whole line was attained and the prospects of success brightened. Additional cars were equipped, and, early in 1890, several were put on the road for regular service, sandwiched between horse cars and running at a uniform rate not exceeding six miles an hour. The fact that they were limited to this slow speed when they could easily go much faster, was a trial to the ambitious motormen who were disposed to regard their positions as quite superior to that of the car horse drivers. Passengers patronized the new cars and the public watched their progress with much interest. Popular opinion turned in their favor, and for a while there was frequent expression of the opinion that the problem of rapid transit in large cities was solved. Still the months ran on into years and the horse cars were not displaced. Then there began to be surmises that the Metropolitan Company was only trying to gain time by making a show of changing its system, and did not really intend to make the use of storage battery motors permanent, even if the scheme proved feasible. As time went on the motors began to show signs of weakness, being frequently seen slowly laboring up the grades with a long line of horse cars behind them, and now and then blocking the road with a flat refusal to move another foot. In such cases their excessive weight precluding the possibility of removing them from the rails, the horse cars were jumped around them until relief could be obtained, when the proud spirited motorman was compelled to resign his command to a plebeian driver and four of the strongest horses from the stable would ignominiously drag the lumbering old ark back to the seclusion of the power house. As many as four cars were stalled at one time. But this was not altogether discouraging, for while the result of the trial of the first storage battery was not successful, the respective promoters of nearly a dozen other schemes stood ready to guarantee that their batteries would do the work. Every one of these was given an opportunity to demonstrate the truth of their claims, and nine different styles of accumulators were tested. The company provided every facility for charging and operating the batteries, and allowed the experts of each company to personally supervise the operations and to show what they could do.

An inspection of the Metropolitan Company's power house and facilities for operating the battery cars clearly evidences the seriousness and determination with which Mr. Pearson undertook the work. The buildings are substantial, spacious structures erected especially for the work. The illustration herewith shows some of the important details, but does not convey a correct idea of the extensive character of the establishment. The boiler house is 50x60 feet, and contains three Campbell & Zell's 200 horse-power boilers set with Murphy's mechanical stokers and provided with appliances of the most approved and efficient character. The engine and dynamo room is 65x85 feet. There are three Wright tandem, compound, non-condensing engines of 230 horse-power each in place, with foundations laid for a fourth engine of the same size. The principal dynamos are Thomson-Houston 160 kilowatt machines, capable of developing a current of 220 volts and 800 amperes, and a number of auxiliary machines provided with ingenious appliances for coupling them in various combinations afford facilities for supplying any desired current. The station is equipped with an exceedingly complete outfit of the best Weston testing and measuring instruments.

The battery house is 85x122 feet, two stories high. The floors are built of cement, laid on heavy iron supports, and are thoroughly acid proof. The arrangements for convenient and rapid handling of the batteries are most complete. This building faces the street along which the main track runs, while the engine and boiler houses are in the rear. By a loop from the main track the cars are run through the building, stopping on a platform, on each side of which is an elevator operated by two Thomson-Houston 15 horse-power motors. The batteries arranged in racks, after being charged in the upper story of the building, are lowered to the side of the car where the exhausted cells are quickly drawn out and the fresh ones put in. This equipment affords facilities for handling 180 sets of accumulators, and the building has space enough for twice that number. The plant, in its present condition, can easily charge 60 sets of accumulators at one time. In addition to the extensive and substantial character of the buildings above described, an item on the company's cash book of $387,000, expended in constructing the plant and operating the motor cars, substantiates the statement that the company has left nothing undone to work accumulators for all there is in them. Forty cars were built especially for this work, and 15 of them were fully equipped for service. The highest number of cars ever out on the road at one time was 10. At the commencement of the experiments, motors and dynamos, especially designed by Engineer Mailloux, were built for the company, but a little later those made by the Thomson-Houston Company were tried and found more satisfactory. Two 15 horse-power motors, weighing 1,690 pounds each, were used on each car. The Baltimore Car Wheel Company's improved storage battery truck added 2,000 pounds, and the total weight of the car thus equipped was six and one-half tons. The horse cars on the Metropolitan line weigh about two tons each.

At first much difficulty was experienced with the regulators, but improvements devised by Messrs. Mailloux and Chamberlain soon remedied this. The arrangements of circuits to secure five distinct rates of speed were as follows:

1. Both batteries in multiple, motor fields and armatures in series.
2. Both batteries in multiple, motor fields in series, armature in multiple.
3. Both batteries in series, motor fields in series, armature in multiple.
4. Both batteries in series, motor fields and armature in multiple.
5. Same as 4 with $\frac{5}{16}$ shunt across the fields.

To sum up the elements of the undertaking, the following points are clear: Steam plant perfect; dynamos and accessories, comprising the charging machinery, everything that could be desired; facilities for handling the batteries admirable; cars and their motor equipments of the best; the track newly constructed by the Johnson Company, of 62 pound improved grooved girder steel rail and in excellent order; the best professional skill obtainable; intelligent, skillful and energetic business management—all essential elements to success—and success must have been attained had the performances of the accumulators been equal to the company's expectations and the promoter's promises. As the records stand, failure must be written for every one of them. They started out with high hopes and ambitions, but hopes were doomed to disappointment, while ambitions and amperes disappeared together.

The names of the nine companies whose accumulators were tested will be designated by number.

No. 1.—The car was equipped with 120 cells, weighing 27 pounds each, and the trial lasted about seven months. The longest run made on one charge was 27½ miles. When the cells were new they were given a charge of 100 ampere hours and the discharge was 86 ampere hours, but this creditable performance was not sustained. After being charged and discharged a few times the efficiency fell steadily and rapidly, and after a service of 1,327 miles the cells were entirely exhausted and worthless. This feature of rapid depreciation was experienced with every battery used. In no instance was the electro-motive force allowed to fall below 1.5 volts per cell.

No. 2 was one of the most promising accumulators experimented with. It was furnished and its use superintended in person by one of the best scientific and practical electricians in the country. Ninety-six cells, 32 pounds each, comprised the outfit for a car. It required 250 ampere hours to charge these cells, and, in return, they gave just 43 ampere hours' service, never making more than six and one-half miles run on one charge. At the end of their 365th mile they were dumped into the scrap pile.

No. 3 was another serious disappointment. One set of 96 cells, 33 pounds each, was first procured, and its service proved so satisfactory that the company ordered equipments for 10 additional cars. The latter were failures. The first was charged in 100 ampere hours, discharged in 86 ampere hours and ran 21¼ miles on one charge. The record of the others shows 420 ampere hours' charge and 43 ampere hours' discharge, with a run of only nine and one-half miles. The total service of the best car on which this system was used was 660 miles. After this discouraging experience there came, with serene confidence and high hopes, the promoters of

No. 4.—Ninety-six 42 pound cells were used. After carefully and faithfully giving them a charge of 450 ampere hours, the car was put on the road, made a fitful and feeble run of exactly 5,000 feet, and never turned a wheel again. Horses hauled the car home, and the accumulator expert left the city before daybreak.

No. 5.—The staying qualities of this battery were vouched for by business managers and electricians of high character and long experience. There were 112 cells, 32 pounds each, in a set. Their record in ampere hours is 100 charge to 86 discharge for the first few trips, after that they fell away rapidly. Twenty-two miles was their longest single run and 3,243 miles ruined them.

No. 6.—The operation of this battery was superintended by two experts representing its manufacturers. After receiving a charge of 250 ampere hours it rewarded its owners by discharging itself in 26 ampere hours, getting the car three miles away from the power house before breaking down. It was never tried again.

No. 7.—One hundred and ten cells, 32 pounds each, ampere hours 100 charge to 86 discharge, longest run 22 miles, total service before breaking down 2,227 miles.

No. 8.—Ninety-six cells, 44½ pounds each, ampere hours charge 100, discharge 86, longest run 22½ miles, total service 4,123 miles.

No. 9.—One hundred and twelve cells, 32 pounds each, ampere hours charge 100, discharge 43, longest run 10½ miles. These batteries failed after running 70 miles.

The best batteries tested did not stand more than 27 days actual service, and the cost of running the cars by five of the most serviceable batteries ranged from 12½ cents to 37 cents per car mile. The cost of running horse cars on this line is about six cents per car mile.

The causes of failure are numerous and not easy to enumerate. Buckling plates, excessive heating, loosening of active material, short circuiting of cells from various causes, general rapid deterioration of positive plates, sudden and sometimes unaccountable loss of current, destruction of connections by acid, are some of the more marked eccentricities of the accumulators. There is a lingering suspicion that they are safer in the laboratory of a professor of chemistry than on a jolting tram-car.

After more than four years of intelligent and persevering effort the undertaking has been suspended. The motionless machinery, the idle cars and valueless batteries, the enormous hole in the company's bank account are full of significance. Every available means to attain success was tried, and failed. The experiment has settled many vexed questions, exploded some humbugs and will be of great value to all persons interested in street railroads. It has made it clear that, up to the present time, science and art have not produced a storage battery capable of supplying power to practically operate such roads as the Metropolitan.

Still the result does not justify absolute condemnation of storage batteries for railway use, nor destroy hope of an independent railway motor. Such a motor is demanded by public need, the inventive genius of the world is challenged to produce it, and there is a growing faith that, somewhere in the conserved forces of the universe, there is a power which shall wipe the unsightly and obstructive trolley lines off the face of the earth, shall bury the power-wasting cables in their own grave, and turn the faithful car horse out to the enjoyment of green pastures and well-earned days of rest.

An Electric Light Tragedy in One Act.

Along the dimly lighted thoroughfare in a suburban town not very far remote there paced a weary traveler, and he muttered as he went along. Block after block he passed with his hands thrust deep down into the pockets of his overcoat. Furtively glancing around, seemingly in fear of his presence being known, he homeward plod his weary way. No other human being was in sight.

Suddenly, from a dark alleyway emerged an individual. He was roughly clad in what seemed to be the remnants from some free clothing fund, and he bore the unmistakable marks of the *genus* tramp. In a haughty and imperious voice, quite different from what one would be led to expect from his personal appearance, he remarked: "Say, young fellow, has yer got der price of a beer?"

The traveler halted and looked the highwayman, for such that individual appeared to be, straight in his eyes, with an expression on his face which seemed to say, "I scorn your demand;" the traveler reached down into some hidden recess in his pocket and drew forth a glittering glass object. It was but the work of a moment; the tramp having seen many times before in his life various and assorted dynamite bombs, for he belonged to the *élite* of the anarchistic circle, seemed paralyzed with fear and awaited what seemed to be the inevitable result.

With a fiendish glare in his eye, with hand uplifted, the traveler threw the glittering object to the ground. An explosion rent the air, fragments of glass flew in all directions, nothing remained but a small brass cap. The tramp fled in dismay, thanking his stars that his head was not blown from his shoulders, for he made sure to feel that it was intact. With a sigh of relief the traveler picked up the brass cap and with a feeling of satisfaction placed it in his pocket, and as he passed under an electric light a solitary policeman heard him mutter, as he disappeared into the darkness, "Well, I guess this is the first time on record where an incandescent lamp ever saved a man from being held up."

The full bench of the supreme judicial court of Massachusetts has decided that an electric street railway company is liable for damages done to street travelers, exercising due care, who are injured by reason of the falling of overhead wires, etc., caused by the failure of the apparatus to support the strain for which it was designed. The case was that of Charles Uggio against the West End street railway company at Boston. The defendant's exceptions were overruled, and a verdict of $6,666 will stand. The plaintiff was struck and injured by the falling of a defective "ear" used on curves.

The Practicability of Electric Conduit Railways.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, DECEMBER 20, 1893, BY ALBERT STETSON.

(*Continued from page 44.*)

Mr. Hewitt: I suppose it is in order to make some remarks on the general statement in this paper, not only as applying to the main subject of Mr. Stetson's article, but the previous part. Referring to this, he says, "With the withdrawal from the field of the Bentley-Knight system, disappeared the last hope of our being able to place bare wires in a slotted conduit exposed to the severe conditions of our American climate." On the next page he says, in regard to the Bentley-Knight system, "They failed, but they made a noble fight, and they did thoroughly demonstrate that a conduit road using a bare wire cannot operate commercially in our American cities." I will not take any issue with him on the success of the Bentley-Knight system, but I do think these statements are too broad. The Bentley-Knight system demonstrated, no doubt, that bare wires placed in a conduit, as they were placed, will not operate successfully. Those two wires were placed directly beneath the slot and very close together, and anything falling in the slot tended to short-circuit them and interfere with the operation, but certainly we cannot argue from that such a strong statement as Mr. Stetson makes.

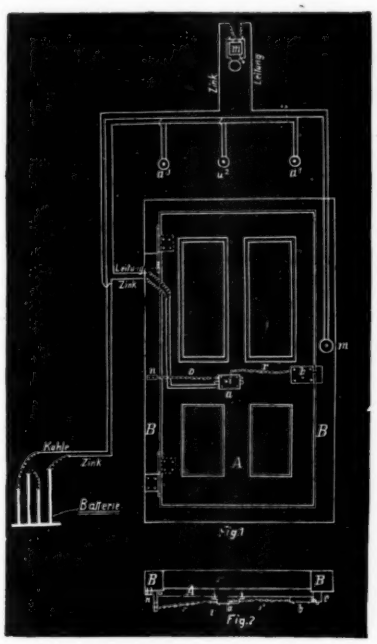
With regard to the Love conduit, which he takes up next, I have had the good fortune to examine the only two roads operated on this system—the road in Chicago and the road in Washington. I had a little better success in Chicago than he had. The road there is one and five-eighth miles long. It goes around several blocks. I made several trips around there, and on three trips we were shut down, from one cause and another, 23 times. That I do not consider a success. It absolutely cannot run in Winter when there is any frost and snow, and the railroad company, I believe, have decided that it is not a success. In Washington, however, the road is vastly improved, and is run on a street where the conditions are far better than in Chicago. It is a beautifully paved street—paved with asphalt. It is a clean street. The road started on the 2d of last March, after all the snow had gone, and has worked successfully, so far as I can find out, through the Spring and Summer and up to date. But how it will operate this Winter is a question which we can hardly answer. It has not been all plain sailing with them there. They have had trouble, largely from mechanical difficulties, so far as I can see. They were limited by an ordinance of the city, which restricted the passageway of the trolley wheel to a very small space. The slot rail, as you noticed in that picture, turns down like this. The city limited them to the width of this passageway. The consequence is that the rims of the trolley wheels come very close to the sides of the iron, and there is evidence there that sparks pass from the wheels to the iron. I found that trolley wheels there lasted about 10 days. I do not claim that the Love conduit is a success by any means, but in my judgment it is to-day the nearest approach to a successful conduit system of any that has been tried.

With regard to Mr. Stetson's system, I have had the opportunity of visiting that at Mr. Stetson's kind request, and I hope he will pardon an honest opinion, although it may differ from his own. He proposes to place in an underground conduit, switches—you may call them switches or you may call them something else. They are working devices placed every 10 feet on each side of the conduit, alternating, making one for every five feet of track. That would be over 1,000 working devices — working switches. I claim that that of itself is a very strong objection. I do not believe that any electrical switching devices can be placed underground a thousand to a mile and be operated in a road like Broadway, New York, with any success. I may be wrong and may underrate the abilities of the inventors, but that is the way I feel about it. I believe that a successful conduit road must be of the utmost simplicity. Now, Mr. Stetson's road is 1,200 feet long, and in the middle of the road there is a curve. I do not know what speed has been attained.

Mr. Stetson: 12 or 15 miles an hour.

Mr. Hewitt: In a good many tests that have been made with the recording speed indicators I have found that it takes some 200 to 300 feet to get up a speed of 12 or 15 miles. Granting, however, that the car did make 12 or 15 miles down there, imagine the continuous effect, with a car weighing 12 tons, striking those contact pieces in the street constantly. Take a street like Broadway, where the cars I believe run on a minute headway. That would be 60 times an hour that those contact blocks are going to be struck a pretty hard blow, and it seems to me it is almost impossible to put any working device in a conduit that is going to be permanent and that will withstand the hammering effect. I do not say that it is impossible, but I say that it has not been demonstrated. Practical demonstration is the best proof of all, and I do not think that a little road like the one at Coney Island, where passengers are not carried and where the cars are only run experimentally, is a demonstration of the lasting properties of such an apparatus.

With regard to the mud test which he refers to, I do not attach as much importance to that as Mr. Stetson does, perhaps. It simply shows the resistance of mud made with fresh water. We have a conductor on one side and a conductor on the other, one positive and the other negative. They are immersed in mud made with fresh water, and it is simply a matter of pressure and resistance. That is all there is to it. Such conditions never would be met with in a street railway. It is an exaggerated case of course. I believe, though, that if that test



FIGS. 1 AND 2.—CONNECTIONS OF ELECTRIC DOOR OPENER.

were made with such mud as we get in our streets, which is very salty and more or less alkaline, the results would be considerably different.

Mr. Stetson: We had more salty mud than you could probably find elsewhere.

Mr. Hewitt: The day I was there the water was running from the city water supply.

Mr. Stetson: But it was Coney Island sand and dirt.

Mr. Hewitt: I did not taste it, and I presumed it was fresh water. Anyhow, that does not contradict the statement that I made that it simply shows the resistance of that mud. That was all that it did demonstrate.

With regard to the statement of Mr. Stevenson, I might take exception perhaps to the insulation resistance, but this I must acknowledge, that the conduit which they have built there is more or less temporary, and perhaps a working conduit put up for regular use would show higher resistance. But 63,500 ohms for a quarter of a mile of line would be considered very low. On a 10 mile track that would not amount to anything.

I must compliment Mr. Stetson on the very strong attitude he has taken in regard to this conduit, and nobody would be more pleased than I to see it made a success. But from the experience I have had in railroad work I do not anticipate the same success for such an innumerable array of switches underground that he does.

(*To be continued.*)

The bids for lighting the streets and public buildings of Brooklyn, N. Y., for the coming year were opened last week by City Works Commissioner Adams. The Edison Illuminating Company, which is controlled by Republican and anti-snap politicians and is looking for some of the plums under the new administration, according to a daily paper, has entered the field as a competitor against the Municipal and Citizens' Electric Light Companies, which for several years have had the business to themselves. The Edison people, it is thought, will be able to secure a share in the contract. Ethan Allen Doty, one of the leading Republican statesmen, is president of the company, and George Foster Peabody, a conspicuous anti-snapper, is its financial backer.

Corliss Compound Engines for Electric Light Work.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, MILWAUKEE, JANUARY 18, BY E. L. DEBELL.

The question of the utility of slow speed Corliss engines for electric light work has been discussed at length among those interested in the subject, and a unanimous verdict has apparently not yet been arrived at.

It is claimed by some that their motion is not steady enough and the regulation not delicate enough for the work, while others believe they are suited for arc lighting, but not for the more sensitive incandescent lamp.

Without attempting comparisons with any other types the writer will endeavor to give the conclusions arrived at from their use in our plant at Sheboygan, leaving each of you who are interested to compare them with results or knowledge obtained of the other types.

In our plant we have been running steadily for the past 15 months a Corliss cross-compound, 24x28 high pressure cylinder, 46 inch diameter low pressure, speed 74 revolutions per minute, rated capacity about 650 horse-power.

We use a syphon condenser, supplied by a duplex pump with two 18 inch steam, and two 12 inch water, cylinders, 12 inch stroke.

We carry constantly 25 inches of vacuum, which, however, can be readily increased to 28 inches should the load be very heavy. When the load is light we consider it the best practice to keep it at 25 inches and reduce the steam pressure.

A good Corliss engine of this size and type should handle its rated economical load on 18 pounds of water evaporated per horse-power hour, and within a range of 20 per cent. above or below that point on not over one-half pound additional. With good boilers properly fired, and allowing seven and one-half pounds of water evaporated per pound of coal, this would equal two and four-tenth pounds of coal per horse-power.

It should be borne in mind at this point that while the first cost is higher for an engine capable of running the least coal, it is really cheaper in the end, as less investment is required for boilers, and the saving in coal continues for all time.

The first cost of the Corliss engine may be placed at one-third more than an equally well made one of the high-speed type, and it takes up about one-third more room. Its life, however, is generally conceded to be 50 per cent. longer, on account of larger wearing surfaces and slow speed. The greater bulk is usually of no serious moment, except where space is restricted or valuable. The cost of attendance and oil and waste is practically the same as on any other good engine, while the cost of and facility of making repairs seems to be in their favor. The latter feature is particularly true of the cross-compound, as the valves and valve gears can be readily overhauled in either cylinder without disturbing the other. As the proper care and adjustment of these parts is of great importance in the economical working of the engine, it is quite an advantage to be able to complete ordinary

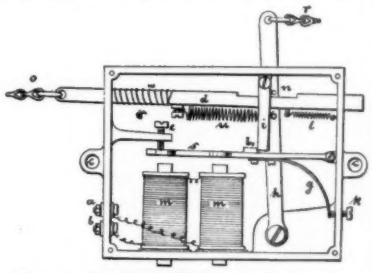


FIG. 3.—INTERIOR VIEW OF ELECTRIC DOOR OPENER.

examinations and repairs in a few hours time. In the tandem compound, one cylinder being directly back of the other, the pistons and heads have to be removed from both to get at the cylinder next the engine frame. In an engine the size of ours it would be practically impossible to do this and make repairs between shutting down and starting time, which is a serious matter in plants depending upon one engine.

The cross-compound being connected to both ends of the shaft, divides the wear between two sets of cranks, cross-heads and bearings, while the tandem, being connected to one end only, the wear falls all on one set. The two cylinders of the cross-compound are connected to the shaft one-fourth turn apart, or, in other words, one is exerting full force when the other is on the center, thus helping to keep the motion regular and steady.

Another feature of the Corliss engine is that trouble usually develops slowly, in most cases giving warning of its existence in time to permit of the proper remedy before it becomes serious, sometimes saving a shut-down of more or less duration.

The selection of proper sizes is a very important consideration, as the addition of an extra cylinder reduces the range of economy. The load in nearly every electric light plant is so variable that one engine cannot do the work properly, and it is probable that in most cases three engines of one size will give the best results. They should be large enough so that one will handle the light load, two of them the heavy load, leaving one always in reserve. This gives an economical size for all the varying loads, and practically duplicates the plant with a minimum expenditure in idle machinery. The cost of the three engines will not be very much greater than the same capacity in one or two engines, and some less boiler capacity will be required.

As to close regulation and steady motion, no trouble should be had on this score if the power machinery is properly installed and managed, and the engines worked within their economical range. We are able to furnish a good light with our Corliss engine, and it is so regarded by our customers. At any time it is found otherwise the trouble is soon traced to some fault in operation and readily subdued.

The conclusion we have arrived at is that these engines are well adapted for our work, economical in the use of fuel, durable and easy of repair.

The proper appliances should be used both in the engine and boiler rooms to ascertain if the benefits paid for are being secured, and, if not, where the leak is. If more fuel is being consumed than seems necessary examine the engines, and if they are working properly ascertain how much coal the boilers are consuming per pound of water evaporated. The trouble will most likely be found in one of these quarters, and when remedied good results will surely follow.

A Novel Electric Door Opener.

A simple, inexpensive and thoroughly reliable electric door opener, which can be operated by a few cells of battery, has been a desideratum. Up to the present nearly all such devices have been subject to the following criticism:

1. They have either been too complicated for practical purposes, or their use has been restricted to the particular shape of a door.

2. The mechanism, though working satisfactorily in the beginning with a considerable battery power, has generally got out of order quickly, causing thereby much trouble and annoyance to the occupants of a house.

And this is the reason why such an extremely useful device has not gone into a more extended use. Among the pioneers in this special branch of electrical work the firm of Kesel & Graser, of Kempten, Bavaria, has taken a leading roll, so that many thousands of their electric door openers are now in daily operation.

Based upon their large experience, Messrs. Kesel & Graser have now constructed a simplified and improved door opener, which is shown in Fig. 3.

The apparatus consists of a draw bolt *d*, with a coiled spring *w* surrounding its end, as clearly shown in the drawing. The spring is so arranged that if it is permitted to act it moves the bolt *d* to the right, causing thereby the catch *i* to assume the position shown in the diagram, assisted also by spring *l*.

Catch or rod *i* impinges against the projecting piece of locking stud *b* of armature *s*, and is thereby prevented from further motion. As will be seen, lever *h* carries a pin *n*, against which rests catch *i*. Chain *r* leads to the spring bolt of the door lock. Spring *g*, regulated by screw *k*, is trying to push armature *s* upward, while *e* is a screw regulating the distance of the armature from the poles of the electro-magnet *m m*, and *a b* are the binding posts for the attachment of the line conductors. Chain *o* is fastened to the frame of the door (see Fig. 1).

The *modus operandi* of the apparatus is as follows: Closing the door bolt *d* by means of chain *o* is pulled over to the left side, placing thereby spring *u* under a considerable tension. As soon as an electric current passes through the coils of the electro-magnet *m m*, its armature *s* is attracted, freeing bar *i* as well as pin *n*, and thus spring *u* draws back at once lever *h*. Consequently chain *r* is permitted to draw back the spring of the bolt, opening the door.

In Figure 1 the device is shown in connection with an ordinary vibrating bell or annunciator system. In conclusion it should be mentioned that the inventors guarantee the absolutely reliable operation of this apparatus with a single cell of battery.

THE BUCKEYE DECISION.

FULL TEXT OF JUDGE RICKS' DECISION DISSOLVING THE TEMPORARY INJUNCTION AGAINST THE BUCKEYE ELECTRIC COMPANY, OF CLEVELAND, O.—A DECISION OF GREAT IMPORTANCE TO OUTSIDE INCANDESCENT LAMP MANUFACTURERS.

In the Circuit Court of the United States for the Northern District of Ohio, Eastern Division.

The Edison Electric Light Company and The Edison General Electric Company
vs.
The Buckeye Electric Company *et al.*

No. 5142. On motion to dissolve preliminary injunction.

STATEMENT OF THE CASE.

This case is now before the court upon a motion to dissolve the preliminary injunction allowed herein on the 28th day of July, 1893. Said injunction enjoined the defendant from using lamps infringing the second claim of Letters Patent No. 223,898, for the alleged infringement of which the bill of complaint was brought. The motion recites what the record discloses: That the letters patent, upon which the bill is filed, bear date the 27th day of January, 1880, and purport to be for the full term of 17 years from that date; that after said letters patent were issued, and on or about the 15th day of November, 1883, Thomas A. Edison, to whom said letters patent were granted, filed with the Commissioner of Patents of the United States a duly verified petition, wherein, among other things, he alleged that while his said application for letters patent was pending he applied for and obtained letters patent for the same invention in several foreign countries, to-wit:

British Patent, dated November 10, 1879, No. 4,576; Canadian Patent, dated November 17, 1879, No. 10,654; Belgian Patent, dated November 27, 1879, No. 49,884; Italian Patent, dated December 6, 1879; and French Patent, dated January 20, 1880, No. 133,755; and that no other patents were granted upon his invention in foreign countries before the grant of said United States Patent No. 223,898, and at the time of filing said application for said United States patent, and while said application was so pending, he was advised that the rules and practice of the office under the prevailing construction of Section 4,887 of the Revised Statutes of the United States did not require an applicant to acknowledge during the pendency of his application a foreign patent applied for and granted subsequent to the filing of such application, and that, therefore, he did not acknowledge the above named foreign patents, and that the United States letters patent were granted to him unlimited for the full term of 17 years. He further in said petition tendered said Letters Patent No. 223,898 to the Commissioner of Patents, and requested that they be corrected so that his said patent should be limited to expire with the date of said foreign patent referred to in his petition having the shortest time to run. The said petition of Thomas A. Edison for such correction of his said patent was duly consented to and concurred in in writing by the Edison Electric Light Company, to whom the said Edison had assigned the said letters patent.

The motion further alleges that the United States Commissioner of Patents, upon the filing and due consideration of said petition for the correction of said patent, granted the request of the said Thomas A. Edison and the Edison Electric Light Company, and accepted the surrender of said patent for the purpose of such correction, and corrected said letters patent in accordance with the request made in said petition, and endorsed thereon such correction, wherein and whereby said letters patent were at the election and request of the said complainants limited so as to expire at the same time with the foreign patent having the shortest time to run, naming said patents as hereinbefore described, and certified that the proper entries and corrections had been made in the files and records, and that the said amendment was made that the United States patent might conform to the provisions of Section 4,887 of the Revised Statutes.

Said motion further avers that said British Patent No. 4,576, dated November 10, 1879, was for the same invention as that for which the said United States letters patent aforesaid were granted, and as your petitioners are informed, advised and believe, and, therefore, allege, was for the term of 14 years from the said November 10, 1879, and that said British Patent, No. 4,576, has now expired.

Said motion further avers that the defendant, the said The Buckeye Electric Company, was organized for the purpose of manufacturing and selling incandescent lamps in the month of February, 1890; that at the time of its organization it had an authorized capital of $100,000, and its investment at that time was about $25,000; that before said business enterprise was started and said capital invested, the parties interested in the enterprise made diligent examination of the records of the Patent Office with reference to patents pertaining to incandescent electric lamps, and also informed themselves as to the prevailing understanding of the trade and persons engaged in similar enterprises as to the rights of parties to manufacture incandescent electric lamps, notwithstanding said Letters Patent No. 223,898 and other patents professing to cover the manufacture of incandescent electric lamps at that time, and, among other things, ascertained that the Circuit Court of the United States, in a case heard by Mr Justice Bradley, had decided to be invalid a certain patent upon incandescent lamps known as the Sawyer-Man Patent, which was considered by the trade and all parties interested as being in all respects as valid as the said Letters Patent No. 223,898, which patent was commented upon and referred to in said case, and that at the time of said ruling the electrical engineers and all parties interested throughout the country accepted that decision as holding that the public generally were free to make, sell and manufacture incandescent electric lamps in the form now claimed, and subsequently decided to be an infringement of the letters patent in the bill of complaint described. And prior to the time that said Buckeye Electric Company engaged in the business there were many other concerns in the United States manufacturing incandescent lamps, among the principal of whom were the Sawyer Man Company, of New York City; the Thomson-Houston Company, of Lynn, Mass.; the Bernstein Company, of Boston; the Sunbeam Incandescent Lamp Company, of Chicago; the Perkins Incandescent Lamp Company, of Manchester, Conn.; the Brush-Swan Company, of Cleveland, Ohio, and others; that none of those companies had ever been sued by the owners of the Edison patent so called.

Said motion further avers that the defendants and those interested also ascertained from such investigation that the particular patent in suit in this case was then believed to have expired by reason of the termination of the Canadian patent, covering the same invention, issued on November 17, 1879, it being, as was then understood by the petitioners, the prevailing opinion of the courts that the termination of the Canadian patent by the decision of the Deputy Commissioner of Patents terminated at the same time as the Edison patent sued upon herein, which had been issued in the United States subsequent to the date of said Canadian patent, and it was the distinct understanding of the defendant at the time said company began business, that there was no valid patent outstanding which could in any way interfere with their carrying on the proposed business of manufacturing and selling incandescent electric lamps. And the defendant, in common with other manufacturers throughout the United States, continued business with its said investment of about $25,000 until the Summer of 1891, without molestation or threat of interference by any one claiming the patents were infringed by the defendant; that in the Summer of 1891 the defendants, The Buckeye Electric Company, having some months before that time discovered and put into practical use a filament superior in every respect to that which was then and is now used by the complainants herein, and had so far increased its business that it became necessary to largely increase its investment. And thereupon further examination was made by the parties interested in the said Buckeye Electric Company's enterprise as to the patent of the said Thomas A. Edison, and it appeared from the examination which was then made for the second time that said letters patent had been, upon the petition of Thomas A. Edison, as hereinbefore described, corrected so that said patent was limited to expire with the aforesaid patents issued by foreign countries having the shortest time to run, and that said patent would expire on the 10th day of November, 1893; that consequently the United States letters patent would expire at the same time. And thereupon and before any ruling had been made by the Circuit Court of the United States sustaining the validity of the said Edison patent, and in full reliance on said petition, and with the concurrence and consent of complainants as hereinbefore set forth, and upon the certificate of the patent as issued and corrected limiting its term as aforesaid, the said defendant, for the further purpose of introducing its improved and superior filaments, further increased its investment in said electric light business so that it now has and since the Summer of 1891 has had invested in said business and in connection therewith about the sum of $125,000. The motion avers that said investment was made in good faith, believing that in no event could the United States letters patent of said Thomas A. Edison continue in force longer than November 10, 1893, which said defendant was induced to believe by the action of the said Edison and his associates as herein before recited.

The motion further avers that after the decision of Judge Wallace, hereinbefore referred to, an appeal was at once taken by the parties to said suit, so that the defendant and others in the same line of business continued to manufacture lamps pending said appeal; that shortly thereafter negotiations were opened between the defendant and complainants with a view of completing some arrangements by which a sale or consolidation of interest could be effected; that these negotiations were carried on constantly from about September, 1892, until February, 1893, during which the defendants operated their factory with the acquiescence and substantially at the request of said General Electric Company, and materially increased its capacity at the suggestion and request of the said General Electric Company. These negotiations finally failed, and immediately upon said failure, the defendant closed its factory by reason of the ruling of the Circuit Court of Appeals for the Second Circuit sustaining such claim of the Edison patent, and said factory remained closed until a subsequent decision of Judge Hallett in the Eastern District of Missouri in a case in which the Goebel defense to the validity of the Edison patent was presented, and the complainants were refused an injunction. Upon such ruling the defendant opened its factory and continued manufacturing until the decision of Judge Seaman, of Milwaukee, when the defendant again closed its factory; and said motion avers that said defendant had at no time knowingly or wilfully infringed complainants' rights.

By reason of the premises, the defendant avers that said United States Letters Patent No. 223,898, so far as the rights of the defendant to now manufacture lamps is concerned, is no longer in force, said invention having been by the voluntary act of the owners as hereinbefore described, dedicated and abandoned to the public; and that by reason of said action the public generally, and especially the defendant, has thus made large investments upon the faith of the expiration of said patent at the date to which its term was so expressly limited by request of the owners thereof, and have now the right to manufacture and use and sell the lamps covered by said patent, and that the complainants by reason of the acts aforesaid are estopped to claim any benefits under said patent as against the defendant since November 10, 1893.

This motion is supported by affidavits of the officers of the defendant, and by most of its directors, each of whom avers the truthfulness of the facts hereinbefore set forth.

The complainants, in reply, file affidavits in which they admit the proceedings in the Patent Office substantially as set forth in the defendant's motion, but declare, with great particularity, the circumstances under which said proceedings were taken, alleging and claiming that the same were taken under a mistake of law and under the advice of eminent counsel. They further deny that the defendant was misled by the negotiations set forth in their motion, and that they in any way impaired their legal rights to insist upon a continuation of the injunction now in force. They further deny that the defendant was misled by reason of complainants' conduct, because of the proceedings in the Patent Office, and deny that they are estopped by virtue of those proceedings to insist that their patent is in force for the full term of 17 years from the date it was issued.

OPINION OF THE COURT.

Ricks, J.: It will be seen from the foregoing statement of facts that the complainants do not deny the proceedings instituted by them in November, 1883, in the Patent Office, substantially as set forth in the defendant's motion. But they contend that they are not bound by the action of the Patent Office, taken upon their petition, for several reasons, among these and chiefly:

First. Because the petition for a limitation upon the duration of their patent, filed by the complainants, and the proceedings in support thereof on their part, were taken under a mistake as to the law, and as to their rights under the patent, and that this error was corrected as soon as possible after discovery.

Second. Because the action and orders of the Patent Office were without authority of law, of no force and validity, and therefore did not in any way affect the patent.

The complainants' statement of the facts under which this action of the Patent Office was invoked, admits that they were advised and believed at the time that such action was necessary in order to remove doubts as to the validity of the patent as originally issued. These doubts arose because of a decision of one or more of the Federal Courts that it was essential to the validity of a patent, where foreign patents for the same invention had been applied for, that the date of such foreign patents and their limitation should be cited in the application, so that the limitation of the American patent would appear on its face. In view of the uncertainties thus existing as to the validity of the Edison patent, because of these omissions in the application for the patent, and to remove all doubts the patentee and the assignee both joined in a petition to the Commissioner of Patents, in which they stated that while the application for Letters Patent No. 223,898 was pending, said patentee applied for and obtained letters patent for the same invention in several foreign countries, as hereinbefore fully set forth in the statement of the case. The petitioners further represented that because of the omissions of such recitals in the application, the United States letters patent were granted to the patentee, unlimited, for the full term of 17 years. The petitioners further say that they were advised that said letters patent, when issued, should have been limited upon their face to the term of the foreign patent having the shortest term prior to the date of the United States patent. Thereupon the petitioners tendered the said United States letters patent to the Commissioner of Patents and requested that they be corrected according to the provisions of the first clause of Rule 164. Upon this petition, the Commissioner issued the following certificate:

"DEPARTMENT OF THE INTERIOR,
"UNITED STATES PATENT OFFICE,
"WASHINGTON, D. C., December 18, 1893.

"In compliance with the request of the party interested, Letters Patent No. 223,898, granted January 27, 1880, to Thomas A. Edison, of Menlo Park, New Jersey, for an improvement in electric lamps, is hereby limited so as to expire at the same time with the patent of the following named having the shortest time to run, viz.: British Patent, dated November 10, 1879, No. 4,576; Canadian Patent, dated November 17, 1879, No. 10,654; Belgian Patent, dated November 29, 1879, No. 49,884; Italian Patent, dated December 6, 1879; and French Patent, dated January 20, 1880, No. 133,755.

"It is hereby certified that the proper entries and corrections have been made in the files and records of the Patent Office.

"This amendment is made that the United States patent may conform to the provisions of Section 4,887 of the Revised Statutes.

"BENJAMIN BUTTERWORTH,
[SEAL.] "Commissioner of Patents.
"Approved: M. L. JOSLYN,
"Acting Secretary of the Interior."

On the 6th day of March, 1893, the complainants, as petitioners, forwarded another application to the Commissioner of Patents, in which they recited their former petitions; the action taken thereon; that subsequent thereto, by decision of the Circuit Court of Appeals of the Second Circuit, said former action of the Commissioner was declared to have been taken without the authority of the law, and, therefore, void, and asking that the former correction of the records by the Commissioner of Patents be canceled. Thereupon, the following action was taken by the Commissioner of Patents:

"Now, in compliance with the request of the parties in interest, said certificate is hereby canceled, and the proper entries and corrections have been made in the files and records of the Patent Office.

"In testimony whereof, I have hereunto set my hand and caused the seal of the Patent Office to be affixed this 15th day of March, 1893.

"W. E. SIMONDS,
[SEAL.] "Commissioner of Patents.
"Approved: CYRUS BUSSEY,
"Asst. Secretary of the Interior."

What is the legal effect of these applications of the petitioner and the action of the Commissioner of Patents thereon? It is urged on behalf of the defendant that these proceedings, deliberately taken by the complainants, amounted to a voluntary dedication by them to the public of the patent from and after November 10, 1893, at which time the British patent expired by limitation. It is contended in reply that, even though such action was a dedication by the complainants as claimed, it was a dedication of something which was to be given to the public some time in the future, and long before the dedication was to take effect, it was revoked and annulled, and no rights thereby passed, either to the defendant or to the public.

Was this conduct and action of the complainants an abandonment of some right, or a dedication to the public of a privilege or right conferred? The arguments on this point have taken a wide range in the briefs of counsel. The action of the complainants in this case, while in the nature of a dedication to the public of a part of the time for which the sole enjoyment of the privileges of the patent were conferred, is not in all respects like the abandonment of a part of an invention by a failure to claim all of it, or by a disclaimer in express words of a part of it. In the latter case, the right of the public to at once appropriate the abandoned or disclaimed part of the invention attaches, and the patentee is powerless to prevent such appropriation. In this case, the complainants did not abandon or disclaim anything that could be immediately appropriated. It was a voluntary act by which they declared a limitation upon the duration of their patent, which shortened their term. It was not, however, as complainants contend, a simple declaration that at the expiration of the shortest foreign patent recited in their petition for correction, they would then dedicate to the public the remainder of its full term of 17 years, conferred by the United States patent. If its legal effect was such a dedication to take effect 10 years in the future, it would have been a gift or grant which might have been subject to revocation. But the time for which the patentee is granted the sole enjoyment of the monopoly conferred is just as much the subject of a dedication and grant to the public as a part of the invention or process. The law on this subject is well stated in Robinson on Patents, Section 345, to be as follows:

"The patent privilege is not a mere reward bestowed upon the inventor for past services, the payment of a debt of gratitude toward one who has already conferred a benefit upon the State; it is also a purchase by the government, acting on behalf of the whole people, of some new art or instrument capable of beneficial use, for which it recompenses

the inventor by securing to him for a *time* its sole enjoyment; and when, without this recompense, it has obtained the invention through his voluntary act, so far from recognizing him as entitled to remuneration, it unhesitatingly appropriates his invention to itself, whatever loss and difficulty may result to him."

What, then, did the complainants intend to do, and what did they think they had the legal right to do, with reference to the legal difficulties which they believed then surrounded them? There can be no doubt as to what their intentions and purposes then were. They asked for the right to limit their United States patent so that it might expire at the same time with the patent named having the shortest time to run. They named in their petition the British Patent, No. 4,576, and therein stated that the said patent was dated as of November 10, 1879. They then believed that said patent would expire November 10, 1893, for, if they correctly stated its date, it would by law then expire. The limitation thus deliberately put upon the duration of their own patent was then believed to be necessary to its validity. Acting under such a belief of their legal relations to the public, they then fixed the limit for their patent for what seemed to them a pressing necessity and a sufficient consideration. Whether the Patent Office was authorized by law, or not, to make such official correction, the petitioners unquestionably had the legal power to voluntarily fix a limit upon the duration of their own patent.

Did that power depend upon future revelations as to the correctness of the legal advice under which they acted? That their proceedings were taken under a mistake of law might give them the right to correct their error by proper application, made within proper time; but such misapprehension could not offset their power of authority to make such limitation of the grant conferred upon them.

But it is contended that their petition for correction was of such an indefinite character that it put the public and all parties interested upon their inquiry as to its legal effect. It is said that the duration of the patents set forth in the petition were not stated; and to ascertain such a limitation involved investigation as to the laws of the respective countries, and that if such investigation had taken place the defendant would have ascertained that the term of the British patent did not begin until it was sealed and granted.

But the public, and those interested in the duration of the patent, had the right to accept complainants' statements as to the date of those foreign patents, and to act accordingly. In their petition for correction they aver that they were not advised that the practice of the Patent Office required an applicant to acknowledge during the pendency of his application a foreign patent applied for and granted subsequent to the filing of such application. The application for the Edison patent was filed November 1, 1879, and the patent was granted January 27, 1880, so that by the admissions of their petition the British patent was both applied for and granted between those dates, and expired between November 10, 1893, and January 27, 1894. The complainants cannot object because the defendant acted upon these representations. If complainants had taken no action whatever, but had relied upon their legal rights as they might be subsequently defined, the public would have acquired no advantages by the proceedings now under consideration. The defendant would have acted at its own peril, and have had no claim such as they now assert. The complainants' conduct and public declaration of the facts concerning their patent are binding upon them, and they cannot now be heard to say that they were made in doubt as to their legal rights, and made in such uncertain terms as to put the defendant upon examination as to the facts and the law, and to be bound by its proper interpretation of them. Even conceding that said petition was filed under mistaken advice as to the law, and that it asked only for such action as the Patent Office might lawfully take, and that the terms in which said action was invoked were such as to put the defendant upon its inquiry as to the law, in was nevertheless a solemn and public act, by which it limited the duration of its own patent to a term shorter than that granted in the original patent. The petition and prayer was for such a limitation, and the complainants are bound by such declaration and conduct. Can there be any doubt as to their right and power to have made such a declaration and abandonment of an existing right? Such power is clearly recognized in Insurance Company, *vs.* Mowry, 96 U. S. 547.

But it is said this dedication was revoked. On March 6, 1893, the complainants filed their petition in the Patent Office, as hereinbefore stated, and recited further that by the decision of the Circuit Court of Appeals for the Second Circuit, said action of the Patent Office was declared to be "without jurisdiction and wholly void," and for these reasons asking that the record of the Patent Office "be amended so as to cancel the said statements and limitations, and so as to restore them to the same condition in which they were at the time of the original grant of said patent;" and further, "that the said certificate of correction, attached to the said letters patent, be canceled so that the patent will be in the same condition in which it was originally granted?" Upon this petition, the Commissioner of Patents on March 15, 1893, ordered "that said certificate is hereby canceled, and the proper entries and corrections have been made in the files and records of the Patent Office."

By these proceedings it is claimed that if the petition for correction, and the proceedings thereunder of November, 1883, amounted to a dedication, such dedication was then revoked, and that the patent stands as though no correction had ever been taken or made.

It is further contended that the holding by the Circuit Court of Appeals for the Second Circuit that the action of the Commissioner on the first petition for correction was wholly void, and that the surrender of the letters patent for correction was without legal authority and of no effect, should be conclusive of this controversy. But this is not a controversy in which the authority of the complainants to surrender their letters patent to the Commissioner of Patents for correction, or his power to make such correction and amend the records of his office, are involved. The defendant is not here asserting any such power or claiming any such result as legal or valid. It is here, however, contended that whether the Commissioner of Patents had legal authority for his action, or not, the complainants certainly had the right and power to publicly and solemnly limit the duration of their own patent, and make record of their intention to abandon it to the public from and after November 10, 1893, the expiration of their British patent. Having done so, and the defendant having in good faith acted on said public declaration, it now contends that the complainants are estopped from coming into court and asserting that such conduct was a mistake as to the law, and therefore not binding upon them. This involves the consideration of the question as to whether the complainants' conduct was a representation as to something it proposed to do in the future, and therefore subject to revocation, or whether it was an abandonment of an existing right. I find the exact question, as it seems to me, fairly settled by the Supreme Court in the case of Insurance Company *vs.* Mowry, 96 U. S. 547. In that case, the court said:

> "The only case in which a representation as to the future can be held to be an estoppel is where it relates to an intended abandonment of an existing right, and is made to influence others, and by which they have been induced to act. An estoppel cannot arise from a promise as to future action with respect to a right to be acquired upon an agreement not yet made. The doctrine of estoppel is applied with respect to representations of a party, to prevent their operating as a fraud upon one who has been led to rely upon them. They would have that effect, if a party who, by his statements as to the matters of fact, or as to his intended abandonment of existing rights, had designedly induced another to change his conduct or alter his conditions in reliance upon them, could be permitted to deny the truth of his statements, or enforce his rights against his declared intention of abandonment."

But in a later decision the same Court said it is not necessary that there should be a design or a purpose to mislead the opposite party on the part of the person to be estopped. In the case of the Leather Manufacturers' Bank *vs.* Morgan, 117 U. S. 108, the Supreme Court approvingly said:

> "In Continental Bank *vs.* Bank of the Commonwealth, 50 N. Y. 575, it was held not to be always necessary to such an estoppel that there should be an intention upon the part of a person making a declaration or doing an act to mislead the one who is induced to rely upon it.
>
> "'Indeed,' said Folger, J., 'it would limit the rule much within the reason of it, if it were restricted to cases where there was an element of fraudulent purpose.'"

Many other cases are cited by counsel, pro and con, which it is not necessary to consider and review. The exact question we have under consideration seems to be met by the foregoing decisions and are conclusive.

While it is true that the complainants' proceedings in the Patent Office were not had with any reference to the defendent, but had reference solely to their relations to the public, the defendent had, as one of the public, the same right to be influenced and governed by the complainants' conduct as though it had been the result of their representations to each other as individuals or corporations. The complainants' proceedings were a matter of public record. Their acts and conduct were of such notoriety that the defendant, by law, was bound to take notice of them, so far as they affected its legal rights under the complainants' patent.

But conceding that there is doubt as to whether the above decisions are conclusive of the controversy, the revocation, which the complainants claim to have made of their dedication to the public, was not made until March 1893, nearly 10 years after their voluntary limitation of the term of their patent, as hereinbefore stated. If they were in doubt as to the legality of their conduct in the proceedings in the Patent Office, they should have acted so soon as such mistake was suggested. They could not wait until the public had acted on their dedication, had acquired rights and equities and then, after the courts had declared their action unauthorized, proceed to revoke their grant.

Did the defendant, in good faith, act upon the complainants' limitation of the life of their patent, and was it induced so to act by the conduct of the complainants, and is it now in such relation to the complainants as estops them from denying that their conduct induced the defendant to make its investments and act as it has set forth in its motion now under consideration?

The circumstances under which the defendant began its enterprise of manufacturing electric incandescent lamps; the different stages in the progress of its development; and the reasons inducing it to increase its capital are fully set forth in its motion and as hereinbefore recited. Whatever may be the complainants' claim with reference to the defendant's statement of the circumstances under which it originally entered into this enterprise, it seems well established by the affidavits of the defendant's directors that its capital stock was increased and its capacity for manufacturing incandescent lamps greatly enlarged by reason of its belief that the complainants' patent by its own conduct was limited so as to expire on the 10th of November, 1893.

This was a very important fact, and the claim that it largely influenced the defendant in its conduct is both reasonable and natural. For the reasons hereinbefore fully considered, it seems to be plain that the complainant is estopped from now claiming that its conduct did not induce such well defined belief as to the limitation of its patent on the defendant's part. Without deciding how far others not similarly situated had the right to rely upon such conduct on the part of the complainants, or without passing upon the question of how far the public generally acquired rights under the complainants' proceedings in the Patent Office, by which they limited the life of their patent, it is sufficient to find, under this motion, that the defendant, by reason of the circumstances particularly set forth in its motion, did rely in good faith upon the complainants' conduct, and had a right to be, and was in fact, influenced thereby.

The application for a dissolution of the injunction is based upon evidence as to a fact which did not exist at the time the temporary injunction was allowed. At the time such application was made, the complainants' patent had not then expired according to the limitations put upon it by its proceedings in the Patent Office. The rule is well settled that on such an application the complainants' rights to an injunction must be clearly established. While it is true that on a motion to dissolve the burden of proof is on the defendant, yet the rule is equally well settled that evidence which would prevent the allowance of an injunction would be sufficient to dissolve it, and that an injunction will be dissolved on new evidence raising grave doubts as to the complainants' right to the temporary injunction in force. The rule is well expressed by Judge Nixon in the case of Cary *et al. vs.* Domestic Spring Bed Company *et al.*, 26 Fed. Rep. 138. In that case the complainants' patent, for the protection of which a temporary injunction was asked, had been sustained by three different Circuit Courts prior to the filing of the bill in Judge Nixon's district. Upon the strength of those prior adjudications, Judge Nixon ordered the injunction "without an examination of the merits or expressing anything upon the validity of the patent." But upon motion to dissolve, new affidavits were offered to show prior use. After an examination of these affidavits, Judge Nixon says:

> "It does not appear that such testimony of prior discovery, knowledge and use of the invention was brought to the notice of either of the learned judges who granted the injunction in the other cases. * * * I do not think that I could have seen my way clear to allow the preliminary injunctions in the present case, if it had been presented on the original motion; and the rule is a good one that the evidence which would prevent the issuing of an injunction, ought to be regarded as sufficient to dissolve one already granted."

For the reasons hereinbefore stated, if, on the application for the injunction now in force, the facts now relied upon in support of the motion to dissolve had been available as a defense, I would not have allowed the temporary injunction. The complainants' right to such an injunction, under such a defense, would have been so doubtful that it would not have been entitled to an injunction under the rules cited.

To continue the injunction now, in view of these doubts, would certainly be a great hardship upon the defendant. According to the affidavits now before the court, the defendant is a solvent corporation. Under the Ohio law, the personal liability of the stockholders is an additional indemnity to which the complainants may look in case, upon a final hearing, its right to a permanent injunction should be established.

As the case is now presented on the motion to dissolve, one of the two parties must suffer loss. If the injunction is continued, the defendant is wholly without remedy. It has shown that it was honestly misled by complainants' conduct, and in good faith made additional investments upon the belief so formed. The complainants cannot complain if, for this reason, the benefit of the doubts expressed are given to the defendant and the injunction is dissolved. If I am in error as to this conclusion, no great harm can result to the complainants, for if such error is established they can recover for the damages caused thereby, and their right to contest as to other infringers not able to show such meritorious claims to estoppel as defendant has established can be asserted without prejudice from this decision.

The Buckeye Electric Company's Views on Judge Rick's Decision.

Mr. Chas. H. Rockwell, secretary and treasurer of the Buckeye Electric Company, Cleveland, O., which has just received such a favorable decision on the lamp question from Judge Ricks, explained his company's position to a representative of the ELECTRICAL REVIEW, as follows:

"The points of our motion before Judge Ricks," said Mr. Rockwell, "were these: We contended that the owners of the patent had deliberately abandoned and dedicated to the public all monopoly of their patent after November 10, 1893, the date of the expiration of the English patent. We also claimed that the owners of the patent are, as to the Buckeye Electric Company, estopped to claim any monopoly under their patent since November 10, 1893, and further that the position taken by the owners of the Edison patent by the proceedings in the Patent Office in 1883, was analogous to an election of remedies, and accordingly cannot now be shifted.

"The decision of Judge Ricks," concluded Mr. Rockwell, "sustained our position and dissolved the injunction against us."

General Electric's Statement on Judge Ricks' Decision.

The General Electric Company issued the following official statement last Saturday, bearing on Judge Ricks' decision:

The British Edison patent does not in any way limit the term of the American patent. Judge Shipman so decided two weeks ago in the Novak case. The decision of Judge Ricks has not yet been received in the East, but the question before him was this:

In 1883 the Edison company, acting under a mistake and believing that their patent might possibly be invalid unless there was some reference to foreign patents on it, secured from the Commissioner of Patents a certificate of correction, which was appended to the patent, in which they referred to the foreign patents for the same invention, and stated in substance that the American patent was limited by those foreign patents in accordance with Section 4887 of the Revised Statutes of the United States. By mistake the English patent was named with the other patents. The argument of the Buckeye company, which probably has been accepted by Judge Ricks, was that although the English patent did not in fact limit the term of the American patent, yet the Edison company was not allowed to say at the present time, in the case of the Buckeye company, and under the special circumstances of that case, that its patent did not expire with the English patent, because of the fact that in 1883 this certificate of correction was put upon the patent. The certificate of correction was removed in the Spring of 1893.

The Edison company does not feel that the decision of Judge Ricks will be approved by the courts generally, and proposes to secure a consideration of the point involved, by appellate courts at the earliest possible moment.

National Electric Light Association.

Secretary George F. Porter has sent copies of the following letter to central stations:

NEW YORK, January 25, 1894.

Gentlemen:—By direction of President Armstrong, I am pleased to extend to you an invitation to attend the Seventeenth Convention of this Association, to be held in Washington, D. C., February 27, 28, March 1, 1894.

Some of the topics for discussion will be: What is the Most Economical Size for Arc Dynamos? Arc Lights on Incandescent Circuits; How to Rate Arc Lamps; Underground Circuits; How to Wire Buildings; Commercial Alternating Motors; Electrolytical Effects of Return Currents; Meters *vs.* Flat Rates; Storage Batteries.

A paper entitled "Electric Lighting at the World's Fair and Some of its Lessons," illustrated with stereopticon, by T. C. Martin and L. Stieringer; "Impressions of a Central Station Man Abroad," by E. A. Leslie; "The Importance of Complete Metallic Circuits for Electric Railways," by J. H. Vail; and other papers, subjects to be announced.

Trusting that your company will be represented, I am,

Yours very truly,

GEO. F. PORTER, *Secretary.*

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The ELECTRICAL REVIEW is not of the vest-pocket size or ambition. It is intended for every-day, practical, earnest people, abreast of these electrical times. Read it every week and you will be better and happier.

The Buckeye lamp people are full of joy, the General Electric people full of astonishment, and Judge Ricks has become electrically famous in a day. The decision declaring the Edison patent expired has aroused the most intense interest, and if it holds, my! won't there be music!

Mr. Geo. C. Maynard's article on "Storage Battery Traction at Washington, D. C.," published in this issue, will doubtless attract considerable attention. It is a frank statement of an honest endeavor to get electric accumulators to do what may reasonably be expected of them and what was claimed for them by their makers. Although the final result was failure, it does not justify complete condemnation of storage battery traction. It should and doubtless will act as an incentive to the inventor to produce a light and efficient accumulator for traction purposes.

What has become of the electrical process for disinfecting drinking water? Vivid descriptions at one time could be found in almost every newspaper and now little is said about it. We have heard that the inventor declares the water thus treated to be a specific against dyspepsia and kindred stomach ailments. It prevents undue fermentation and consequent gas accumulations.

A dealer in arc light carbons once remarked, "German carbons can only be made in Germany." By this he meant that the workmanship in Germany and in this country is of a different class. The Germans are more careful, precise, and in short better workmen in this line of work. There can be little doubt, however, that if a workman accustomed to the method employed in the old country could be brought here for the purpose of running a carbon factory on German principles, much benefit would accrue therefrom.

We all remember the good old times when it was the common practice to sell incandescent lamps at 85 cents. Now the price has decreased 60 per cent., and we even find a lamp manufactured under the Edison patents which may be purchased in Germany for the modest sum of 15 cents, and the manufacturers declare that it is to be rated at 2.6 watts per candle-power. How different is the present condition of affairs from that of 1880, when the gentleman who represented Mr. Edison at the Paris Exposition in the Palais de L'Industries, and who so successfully introduced the electric light into Europe against many obstacles, had but one barrel of lamps at his command.

Electric irons for laundries, shirt factories and other manufactories where a considerable amount of ironing is done are gradually being appreciated by those who have such departments in charge. In the present system gas is employed for heating, and two irons are used, no time being lost in work, other than pressing. In Summer, especially, the atmosphere of a pressing room is almost insufferable. The girls value the electric iron, and anyone who has ever used one is immediately prepossessed in favor of it. In apartment houses or hotels where great quantities of ironing are done they will be found especially advantageous. Unfortunately, however, their expensiveness prevents their immediate general adoption, but as soon as some cheaper device is obtained, whereby the same work can be done for less money, they will be found in every household or manufactory requiring them.

THE PRESIDENTS SHOULD ATTEND.

The first president of the National Electric Light Association, Mr. J. Frank Morrison, of Baltimore, will be present at the Washington meeting. He will be warmly welcomed by the electric light men, particularly by those who participated in the early struggles of this association. If all the other ex-presidents would decide to attend, we could have an official round-up at Washington that would be full of interesting and valuable reminiscences.

The half-dozen presidents of the National Electric Light Association are named in order:

J. Frank Morrison, Baltimore, three terms.
S. A. Duncan, Pittsburgh, one term.
E. R. Weeks, Kansas City, Mo., one term.
M. J. Perry, Providence, R. I., one term.
C. R. Huntley, Buffalo, N. Y., one term.
Jas. I. Ayer, St. Louis, Mo., one term.
E. A. Armstrong, Camden, N. J., present incumbent.

A WAIL FROM SCHENECTADY.

An engineer in the employ of the General Electric Company, who was among the number recently transferred to Schenectady, N. Y., writes to a friend that "life is not what it used to be." He says that all the offices are in one large unpartitioned room about 50x50 feet in size. The letter continues as follows:

"Things are worse here even than we expected. Office hours, 8 to 5, with a short hour for lunch from 12 to 1. We come in and go out by whistle, and it's rumored the lock-step will be introduced next week. Captain G. sits at the head of the room and keeps school. He has just issued an order preventing all smoking in the office. They seem to enjoy rubbing it in. One thing more, we are expected to work Saturday afternoons just the same. When they prescribe a striped suit and give us our numbers, our degradation will be complete."

This must have been written by a very fresh young man. In these hard times smoking is a very expensive habit and should not be encouraged. We have no doubt but that "Captain G's" ideas on this subject are entirely altruistic. As to the office hours—why, we used to work from sun up to sun set for board and clothes and we thought we were beating the "old man" at that. As for the suggestion in regard to striped clothes, everything about a well managed company should be *uniform*, even the attire of the office force. Look at the employés of the great Wagner Palace Car Company—there is no more uniform set of men in the world. Young fellow, you don't seem to know how well off you are!

LATE MOVEMENTS IN THE TELEPHONE REVIVAL.

The National Telephone Manufacturing Company, of Boston, is one of the competing companies from which genuine telephone work may be expected.

There is about $100,000,000 invested in the telephone exchange business of the United States. A pretty good watermelon if you only know how to cut it.

The Citizens' Telephone Company has been organized to operate in St. Joseph, Mo., and applications for subscribers to sign are being circulated. Wake up, General Manager Wiley W. Smith.

The Metropolitan Telephone and Telegraph Company, of New York, has just purchased the property at 15 Dey street, in the rear of its present building, 18 Cortlandt street. The price paid was $100,000. Telephone competition in New York city will find a hard road to travel.

It is rumored in Boston that the American Bell Telephone Company will petition the Massachusetts Legislature for the privilege of increasing its capital stock. The present capital is $20,000,000, and the increase will probably be to double that amount, or perhaps make it a round $50,000,000.

The biggest capital stock of any of the companies organized to compete with the Bell monopoly is possessed by the Harrison International Telephone Company, of Chicago. Eighty million dollars is the figure. We presume at least one-thousandth of one per cent. of this amount was paid in in cold, hard, round dollars.

We have received an inquiry for the address of the National Improved Telephone Company. This company was organized some 10 years ago under the laws of Louisiana, and if we remember aright one of the officers was a gentleman by the name of Chas. A. Randall. We do not know whether the company is in existence to-day or not.

CORRESPONDENCE.

OUR WESTERN LETTER.

Mr. George O. Fairbanks, the assignee of the Railway Equipment Company, will have his report ready this week, and the indications are that it will be very favorable to the creditors.

Mr. W. J. Buckley is about to issue a manual and book of tables containing data relative to the management of electric light and power stations. A more extended reference may appear in these pages later on, but it will be a wise move for each central station manager desiring a copy of this work, to send his card to Mr. Buckley, 185 Dearborn street, Chicago.

Change of Name.—The Star Electric Lamp Company, Chicago, manufacturers of the Sunbeam lamp, has changed its name to the Sunbeam Lamp Manufacturing Company. The policy of this company is to furnish lamps superior in quality. Recently some discoveries have been made, as the result of the extensive experiments they have carried on, which they claim will greatly improve the quality and add to the value of their lamp.

Mr. H. George Field, electrical inspector of the Michigan Inspection Bureau, Detroit, is in Chicago, looking up the subject of heat regulation, more especially as applied in the Johnson system. Referring to the method of inspecting electric light and power circuits, Mr. Field stated that the local bureau was not only firmly upholding the rules of the Underwriters' Association, but adding thereto certain local provisions that strengthen the former.

Prof. John P. Barrett was interviewed on the telephone question by the Chicago *Tribune*, and said: "The Bell Company's patents cover a large number of auxiliary devices, such as the carbon transmitter, the automatic arrangement for closing and opening the current through the local transmitter, and the universal switch board. All of these are essential in the economical operation of large exchanges. The patent on the duplicate switch board has several years to run."

The Northwestern "L."—Considerable space in the local papers is being devoted to a proposed extension of the proposed "L" road to Milwaukee, the necessary funds for securing the right of way and constructing the line to be contributed by the holders of the desirable property along this proposed line. About 175,000 people now live in the section between this city and Milwaukee, and it is expected that this number would double in a few years if rapid transit facilities were afforded.

Prof. John P. Barrett has issued a pamphlet for the guidance of architects and builders containing the rules for installing circuits and machinery. Two of the rules read as follows:

The use of wire ways for rendering concealed wiring permanently accessible is most heartily indorsed and recommended; and this method of accessible concealed construction is advised for general use. Architects are urged, when drawing plans and specifications, to make provisions for the channeling and pocketing of buildings for electric light or power wires, and in specifications for electric gas lighting to require a two-wire circuit, whether the building is to be wired for electric lighting or not, so that no part of the gas fixtures or gas piping be allowed to be used for the gas lighting circuit.

Chicago, January 27. F. DE L.

A Method of Determining Values of a Periodic Electro-motive Force.

In the ELECTRICAL REVIEW for January 24, 1894, page 41, second column, twenty-eighth line, for "electrodes" read "electrode S." The same correction should be made in the fiftieth and fifty-ninth lines of the second column. In the first line of this third column "coils" should read "coil." These changes are requested by Mr. F. H. Loring, the author of the article.

The Late Dr. Hertz's New Book.

"Electric Waves," by the late Dr. Heinrich Hertz, has just been issued. This valuable work can be supplied by the ELECTRICAL REVIEW, postage paid, at $2.50 per copy.

RUMORED OPPOSITION TO GENERAL ELECTRIC.

LYNN ADVICES STATE THAT PROF. THOMSON AND OTHER SHINING LIGHTS OF THE THOMSON-HOUSTON COMPANY WILL START A BIG ELECTRIC COMPANY OF THEIR OWN—A NEW INCANDESCENT LAMP.

On Monday morning the following special dispatch was published in the New York *World*:

LYNN, Mass., January 28.—Prof. Elihu Thomson, the inventor and main reliance of the Thomson-Houston Company in defending its patents, has declared war upon the General Electric Company, and, according to his associates, is to be one of a number of the original Thomson-Houston people to try to secure the big West Lynn plant for a new corporation which will manufacture under his patents.

It is understood that Prof. Thomson declares he never sold his arc lamp to the General Electric people, and he claims to have another incandescent lamp which will drive the one now manufactured by the General Electric out of the market.

Soon after the consolidation the Thomson-Houston people claimed the Edison people had misrepresented their assets, and they brought suits in this State, under various pretexts, to discover whether it were possible to divorce the original Thomson-Houston from the General Electric. They did not find a legal way to do this, and the determination to start anew followed. John Pevear, a local capitalist, is mentioned as the probable president of the new corporation.

The original contract with the General Electric made it obligatory on Professor Thomson to offer all of his inventions to that company first, but it appears that the company has not kept its part of the contract and that the professor prefers cash to promises. This is why he has not prepared to follow the caravan to Schenectady.

The factories of the General Electric here will close February 1 for an inventory, but it is not believed that they will open again as announced. Eighteen months ago there were nearly 4,000 persons employed at the West Lynn plant but now only 500.

The Thomson programme is war to the knife on the old concern and no alliance, friendly or otherwise, with any other corporation.

The immediate effect of this report in Wall street was to knock General Electric down to 33 very shortly after the opening of the Exchange Monday. While the reports published above were not accepted in their entirety, it was believed in Broad and Wall streets by those familiar with the situation that this news may be the nub of the recently circulated rumors that the Thomson-Houston company would withdraw from General Electric.

A prominent electrical broker when told of these rumors by an ELECTRICAL REVIEW representative said: "I cannot believe this until it is confirmed. I don't see how Prof. Thomson can hold his arc lamp patents because they originally belonged to the Thomson-Houston company, and everything this company owned was bought by the General Electric company when the combination with the Edison interests was made. Granting the correctness of your information such a company as Prof. Thomson and Mr. Pevear could form would be a very important factor in the electrical field and a serious competitor of General Electric."

Counsel F. P. Fish, of the General Electric Company, when seen by a representative of the ELECTRICAL REVIEW, characterized the report as absurd. "The relations existing between Prof. Thomson and the General Electric company," said Mr. Fish, "are as pleasant as they have always been. Prof. Thomson is working for the company, and the terms of his contract have been lived up to by both parties. The reason Prof. Thomson did not go to Schenectady is because he settled in the East."

It is stated on good authority that as the executive committee of the West End Railway Company, of Boston, did not receive sufficient encouragement as to the prices at which the contemplated bond issue could be placed, that it is probable that construction will not be now pushed, but will rather proceed slowly and be paid for out of surplus earnings.

Wall Street and the Electrical Stock Market.

The Wall street market during the week has been almost entirely professional, there being a marked absence of operations by the general public. It has been almost wholly controlled by manipulation based upon Washington news and has fluctuated between narrow limits each day.

The trade agencies continue favorable reports, showing that the turn in the business conditions has come. Resumptions of factories during the week amounted to 62 against 17 shut-downs. Wages are being reduced quite generally, the amount ranging from 7 to 25 per cent. There is a demand for clothing of all kinds which springs from the imperative necessities of the country.

The market for electrical securities has been noteworthy for the comparatively heavy demand for various bond issues. The stocks, barring Western Union and General Electric, were more or less neglected.

Western Union has been the football of speculation this week. Its fluctuations however, were very narrow, considering its activity. I noted last week that long stock was being marketed. This movement seems to have continued. The highest price was 86 on Monday. In the subsequent days it declined and rallied, touching 83¾ on Friday, closing at 84 and rallying slightly to-day. There is no doubt but what there is a heavy short interest which is reflected by the loaning rate which is $\frac{1}{64}$. The manipulation was accompanied by the talk of a reduction of dividends. People connected with the property, while admitting that there is a decrease in earnings, maintained that there is enough surplus to keep the dividends at the old rate.

A director of the company states that the open Winter has been worth, roughly speaking, $100,000 to the company, as very few repairs have been necessitated by storms.

General Electric touched its highest point on Monday, being 36½. On Wednesday it declined to 34½ on the decision of Judge Ricks in the Buckeye incandescent lamp suit, which is fully treated in another column. Upon assurances from officers of the company that the decision was only local in its nature, the stock rallied on Thursday, and on Friday it again sold off. President Coffin was quoted this week as saying that the Lynn works would be but little used in the future, and the outcome might be the shutting down of the factories entirely. He said that the factories at Schenectady were far superior and would accommodate 6,000 employés. They can be run much cheaper, and land can be purchased by the acre at the same figure that it can be bought by the foot at Lynn.

We publish in another column a list of the securities which the company turned over in the funding Trust that cared for its floating debt. They represent an interest in 120 different properties. This reflects one of the weakest phases of the company's position in the trade to day. Heretofore it has been able to sell its equipment and supplies to these companies because it had the "call" upon them. When it won its incandescent lamp suit it adopted a very aggressive policy towards the users of its lamps with the result that many of them were antagonized. They could not transfer their patronage to competitors for the reason that General Electric had a property interest in their enterprises. The sale of these securities has caused them to virtually pass out of the control of General Electric, and even should the Trust, which is now caring for them, work with the General Electric, its influence will be only temporary as its plan is to unload these various securities on the public. When this liquidation is complete, General Electric will find itself stripped of all say in the management of these properties and upon no more favorable footing for securing business than others of its competitors.

There has been some inquiry as to the *personnel* of the officers of General Electric. It is as follows: President and General Manager, C. A. Coffin; vice-president, Eugene Griffin; secretary, E. I. Garfield; assistant treasurer, B. F. Peach, Jr.; assistant general manager, S. V. Greene; A. S. Beves, treasurer; and J. H. Herrick, third vice-president, recently resigned. The vacancy in the second vice-presidency, caused by the resignation of Samuel Insull, some time ago, has not been filled.

Edison Electric Illuminating received limited transaction at 95½ and 95¾. American Telegraph and Cable sold at 88 and 89.

Thirty-eight thousand dollars of the Edison Electric Illuminating First 5's were traded in at 103½ to 105; the advance being due to the transactions. It looks to me as if some interest is picking up these securities. Forty-two thousand dollars of Western Union Collateral Trust 5's sold at 103½ to 104. The transactions were scattered over each day of the week. It is an interesting fact that both the Western Union and the Edison Electric 5's pay the same rate, namely, 5 per cent., and sell at the same figure. It would seem to indicate that this is about the market for a first-class 5 per cent. bond.

I hear a good deal of bull talk regarding Westinghouse. Mr. Westinghouse was interviewed this week, stating that he can manufacture the Sawyer-Man stopper lamp more cheaply and economically than he could manufacture the Edison lamp. He proposes to introduce the glass stopper incandescent lamp that cannot be undersold. He admits that his regulator for the arc lamp is not as good as the regulator of the General Electric lamp, but he hopes to improve it. He has perfected an arrangement whereby his arc and incandescent lamp can be run on the same alternating circuit. The company shipped $500,000 of goods in November and $600,000 worth in December. The company will be compelled to work nights in order to complete its Niagara power plant equipment.

On the Boston Exchange the first preferred stock was bid 46 and held at 46½ par of 50. The assenting certificates, par 50, was bid 25¼ and held at 26.

Bell Telephone showed further weakness, declining in the week from transactions of 179 on Monday to 170 bid and 174 asked Friday. This is due to causes mentioned in my last report. Boston furnishes the information that considerable stock is taken in lieu of new competing companies, and also to a growing belief that the 6 per cent. annual extra dividends are likely to cease. New capital is invested in the long distance business which does not pay better than 6 per cent. Despite this the position of the company is very firm as it has perfected a complete system of copper wiring between commercial centers on which Morse business can be transmitted without interfering with the telephone business.

On the Boston Exchange Erie Telephone and New England Telephone were unchanged on limited transactions. General Electric preferred was firm at 60. Fort Wayne Electric showed some strength, being bid 4 and held at 5. The quotations on this stock a few weeks ago were 3 and 4.

New York, Jan. 27.

PERSONAL.

Mr. W. Williams, 17 Fink's Building, Melbourne, Australia, is desirous of securing trade literature on the subject of improved methods of cutting and mining coal.

On Wednesday, January 17, the delegates to the convention of the Ohio Society of Civil Engineers and Surveyors visited the Correspondence School of Technology at Cleveland, Ohio.

Mr. W. S. Dimmick, for seven years manager of the Omaha, Neb., office of the Postal Telegraph Company, has resigned from that position and has been made superintendent of the Omaha and Council Bluffs Street Railway and Bridge Company, vice A. K. Stone.

Mr. J. Potter, the well-known electric light and railway man of Cleveland, O., and who was recently elected vice-president of the Buckeye Electric Company, of that city, was in New York last week when he heard Judge Ricks' decision in the Buckeye lamp case. Needless to say, Mr. Potter was very much pleased.

A jury in Judge Grosscup's court, at Chicago, has returned a verdict against the Illinois Central Railroad Company for $43,000 in favor of Wilbur F. Davidson, who lives at Port Huron and is general agent for the State of Michigan for the General Electric Company. He was hurt near Fifty-third street, Chicago, on the night of February 27 of last year, while alighting from a train. A jury some weeks ago failed to agree. Davidson sued for $100,000.

Congressman Tom Johnson is the son of a Kentuckian who was a colonel in the Confederate army, says the New York *Sun*. The son rapidly grew rich through street railway patents and franchises, and he is now financially interested in several important manufacturing enterprises. He became an unwilling convert to Henry George's land theory some years ago. Having read "Progress and Poverty," and being unable to meet its arguments to his own satisfaction, he turned over the book to his lawyer, and asked him as counsel to read it and render an opinion traversing its argument. But the lawyer, after reading the book, assented to the argument, and Mr. Johnson, having made further personal examination of the question, enrolled himself among the disciples of Mr. George. Mr. Johnson and Mr. George have been close friends for some years.

"Consular Reports" for January, 1894, has been received.

Economy in the Use of Transformers.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, MILWAUKEE, JANUARY 17, 1894, BY PARMALEE J. MCFADDEN.

The subject which your committee has chosen, and on one side of which it has asked me to speak, is one that I approach with no few misgivings. I appreciate that I am speaking to men who have given the subject more attention than I have and whose knowledge of practical central station management has placed them in possession of facts which my more limited knowledge has not vouchsafed to me.

On the other hand, however, the consciousness of the technical culture of my audience encourages me to venture the few remarks I have here jotted down, for I feel that what merit they may have will not be lost, while their demerit will be ventilated and we all be made the wiser for any corrections which the discussion which follows will make.

Fortunately, I am restricted by the title as given me to tell of how transformers may be operated economically, as this relieves me of the task of roaming all over the subject of transformers and telling of all the possible ways in which they might be operated.

Another paper which you will hear this evening will give in more detail a description of various transformers and of the internal actions taking place in them, and, therefore, I will not bewilder you with my uncouth efforts to make this interesting phase of the transformer clear.

I will assume only that you will have stations operating an alternating current, or that those who have not are at least familiar with principles underlying it. Why is it that a circuit of 1,000 or 2,000 volts is run through your streets, instead of a harmless one of 50 or 100 volts, requiring no transformation? Those of you who have paid large bills for copper conductors know this only too well. I will assume, then, that you are familiar with the system of distribution of energy by alternating currents in general, nay, with apologies to those of you whose attention has been drawn to a better practice, I will assume that you are familiar only with the plan that has almost universally been followed during the few years that alternating currents have been handled commercially at all. This, then, will lead me to the particular phase of transformer practice about which I was to speak to you to-night.

Let me first appeal to your sense of mechanics, which tells you that every machine (I think there are exceptions—at least in the realm of electricity) will operate most efficiently at its rated load. Now a transformer is nothing more than a dynamo without moving parts, and is, therefore, no exception to the rule in that it works best when loaded up to its rated capacity. In selecting a transformer for a given customer, the central station superintendent will too often install one capable of supplying the total number of lights for which the house is wired. In some cases this cannot be avoided, but in houses wired say for 40 to 50 lights it will seldom be necessary to put up a transformer any larger than a 30 lighter, and right here I would say that a transformer of a whole size smaller can often be used if the superintendent would take the trouble to consider the case of the particular customer in question. The neighborhood, the size of his family and their habits relative to the probability of entertainments involving the burning of nearly all the lamps in the house, would all with a moment's consideration, determine sufficiently closely what the maximum load would be. I think you all can think of a dozen or more of your customers who have much larger transformers than there is any necessity for, as often a house has been wired under the direction of a former tenant or owner, and outlets have been put in rooms far in excess of the requirements of the present occupant. Now the evils of this are two-fold. In the first place you have more money tied up in the apparatus than there is any necessity for; and second, the transformer is being run less economically than if its size were nearer that of the load it had to provide for. To make a rough illustration, you can carry a gill of water in a wooden pail as easily and as safely as you can in a teacup, but when you come to pour it out you will find that the teacup will net you a greater return than the pail. Similarly, but for quite different reasons, a 50 light transformer will transform the current for 15 lights, but the loss in the transformation will be greater than if you had used a 15 lighter.

I would say, then, that where you are obliged to use a transformer to each customer, that your first consideration be the selection of as small a converter as the load will permit.

But is it always necessary to install a transformer for every individual customer? Are not some of your stores, or even in some cases your residences, so bunched that one transformer could be made to do for several; and if so, would you not, if necessary, go to a little trouble with your secondary wiring to accomplish this? Even the bunching of, say, three moderately large transformers to serve four or five customers, where one, or at most two, are likely to have a large load at one time, and where this comes so seldom as to make it expensive to put up for each of them a transformer capable of taking that load, while a step in the right direction is seldom good practice, for if the primary fuse of one should blow them out, not only does the secondary of that transformer (which is now dead, as far as its capacity to give out current is concerned) become a load upon the other two, but also the load of lamps it formerly carried must now be borne by the others. When this is the case the fuses of the other two will be likely to blow, and the whole arrangement disabled.

One case has recently come to my notice, showing how in practice the substitution of one large transformer for several small ones has worked to the saving in first cost to the station, and, as we know from the principle of the transformer, in the economy of operation as well. In this case a 90 lighter replaced one 15 lighter and five 25 lighters, which had been used to supply 34 store and saloon lights, 43 residence lights and 93 church and society hall lights, these all being within a radius of 500 feet from the present large transformer.

Here were 173 lights to provide for, and for which the station formerly had six transformers, aggregating a capacity of 143 lights; and as these are now being taken care of by a 90 lighter, he has a transformer of a capacity of only 52 per cent. of the total lights connected, where before he had six transformers with a total of 80 per cent. of the lights connected. The conditions here were somewhat favorable, for the store lights would usually be out when the society hall, or certainly the church, lamps were lit, as this would usually be Sunday night. In this case the superintendent took the trouble to observe the conditions, and knew from experience what the maximum load of this combination would be, and he was thus enabled to choose a comparatively small transformer to do the work of all and to keep it well loaded all the time. From a cursory view of the conditions, it might have seemed that certainly a 125 or a 150 lighter would have been necessary.

As the maximum load did not exceed 90 lights, and, in fact, the average load was about that, we will assume that the six transformers as originally installed were loaded as follows:

1-15	light at	2/3	load—	10	lights—	efficiency, say 94%.
2-25	"	1/2	" —	25	"	" " 94%.
2-25	"	3/4	" —	38	"	" " 95%.
1-23	"	5/8	" —	17	"	" " 96%.
				90		

This would make an average efficiency of $94\frac{3}{10}$ per cent. Now a light transformer at full load would operate at about 97 per cent., a saving of at least two and one-half per cent. Then comes the question of regulation or the drop in potential of the secondaries when running lights. When the individual transformers were installed separately, it frequently occurred that at times one or more might be carrying a very light load and the addition of a very few lights would be a good many per cent. of the transformer's load, and the voltage would drop and show in the dullness of the light. Where a large transformer is installed, that same number of lights is a very insignificant portion of the whole load, and no appreciable change in the voltage is noticed in suddenly switching them on or off. In this particular case, the station superintendent reports that there is a noticeable improvement in the steadiness of the lights.

Another case I have in mind is where a 125 light transformer replaced two 40 lighters and one 25 lighter, connected with nine residences containing 143 lights, and to these were added three more residences with 130 lights, making in all 12 residences having 273 lamps wired up.

Thus, all the lights are supplied by a transformer of but 45 per cent. of the total lamp capacity wired up.

Aside from the advantages of regulation and efficiency which are far reaching in that their effect is operating continually, there are other and quite as palpable ones that especially recommend this system. Perhaps first of all comes the saving in the first cost. You all know how much cheaper a 100 light transformer is than a 100 light capacity in smaller sizes. This plan not only preserves to you this advantage in first cost of large transformers, but as has been shown, also permits of your using a very much lower capacity than the aggregate of the lamps wired up. There is a greater saving in the cost of installation and in the cost of repairs. Further from this the danger from lighting in the primaries is reduced at least in proportion to the number of transformers replaced.

For the purpose of illustration and to make the matter appeal to you if possible more than the bare statement, I have given you the above examples, as being actual practice of one of your number, and I think the application is sufficiently clear to appeal to you in instances which many of you no doubt could bring to mind, where such a plan could be worked to the great benefit of your station.

I have spoken until now of the use of large transformers with secondaries connected on the ordinary two wire system, using, if desired, and the distances are not great, 52 volt lamps; otherwise 110 volts; but why stop here? The very reason why you adopted the alternating system was on account of the saving in copper in the mains and feeders, and you did this by sending a small current to a great distance at a high voltage, knowing that it is only amperage that demands a large cross-section of copper. Now why not apply this principle to the secondary wiring as well, using as high a voltage as is permissible in practice? Manifestly this can be accomplished by running the secondary wiring on the three-wire system, having a difference of potential of 220 volts between the outside wires and using 110 volt lamps. Here again we introduce a feature, that added to those above enumerated as being present in the use of large transformers, makes the system of three-wire secondary wiring from transformers the most efficient that modern practice is capable of. The loss in the secondary wiring is here cut down to a minimum, as the current is only one-fourth of what it would be with an equal number of lamps of 52 volts, and for the same percentage of loss, the actual drop in volts can be doubled. As a consequence the wire for a 220 volt circuit would need to be but five sixty-fourths of that for a 52 volt circuit for the same cost. A number of cases of this method of wiring are in Chicago, in theatres and large buildings, which is a class of work to which this can be applied as advantageously as with outside work. In the example first above given, where a 90 light transformer supplied lights at a distance of 500 feet, there would have been great saving in the secondary wiring, even if two 50 lighters had been used, but the secondaries run on the three wire system.

Ordinary transformers can of course be connected in pairs with their 100 volt secondaries in series and run out on three wire, but a still greater saving is secured in using a transformer whose secondaries are so brought out that a three-wire service is obtained directly from the one transformer.

As being directly in line with the subject of this paper, I might have spoken of the transmission of energy by the three-phase system—a plan that is being adopted largely where an inexpensive water power is located some miles distance from the point at which the light or power is to be used, and even more recently in ordinary stations.

Another and somewhat older plan for transmitting the energy to a great distance is to generate the current at, say, 1,000 to 2,000 volts as usual, and in the station have a "step-up" transformer which will transform the current to one of 5,000, 10,000 or 20,000 volts, and to send it at this high pressure over the five or 10 miles to the locality in which it is to be used. Here will be provided a "step-down" transformer whose function is just the reverse of the "step-up," that is to say, it will convert the said 10,000 volt current to one of 1,000 or 2,000 volts, and at this pressure it can be distributed through the town just as if a 1,000 or 2,000 volt dynamo in the town were furnishing the current. From these primaries the distribution to individual consumers is identical with ordinary practice.

Of course the chief advantage of this plan is in using an inexpensive water or other power plant, although removed at a great distance from the point of application.

Opportunities for the employment of this latter plan are rare in stations in this section, and I have purposely confined my remarks to the employment of large transformers on the two-wire, or, better yet, two transformers with secondaries connected in three wire, or, still better, and best of all, one large three-wire transformer, thinking that as applications of these can be made in the plants of each one of you who is using alternate current, the matter would be emphasized and would appeal more forcibly to you than if I had made this short paper more general in its character.

Manufacturers are loath to advocate this substitution of one large transformer for several small ones, as such a plan universally used would affect very materially the amount of their business; for the cheapest way to buy transformers is to get large units, and they are in no hurry for customers to find this out. The flood of second-hand small sized transformers, of which second-hand dealers have doubtless given you due notice, is only an evidence that somewhere large transformers have supplanted an enormous lot of smaller ones, and that the tempting bait of low prices for this discarded apparatus is difficult to withstand, and a station superintendent is almost blinded to the merits of the large transformers by the dazzling brilliancy of these "bargains."

The whole thing is a matter of simple arithmetic; and without knowing in detail any of the conditions of your individual plants, I feel assured that a rough inspection will reveal several places where a judicious grouping of your customers could be made, a large transformer or a three-wire plan adopted, and the replaced transformers used on new consumers where the plan will not work so well.

If I have succeeded in interesting you in this subject—those of you who have not already tried this, or whose attention has not heretofore been drawn to it—I shall feel amply repaid for my time, for I know that your desire for the economic running of your plant will prompt you to look into the matter further, and to test its soundness in your individual station.

Allow me to thank you for being permitted to address you and for your attention in listening to me.

The electric light question in Richmond, Ind., which has been agitating the public for many months, has been settled by the Council. Municipal ownership was voted down, and a contract awarding a 10 year franchise to the Richmond Light, Heat and Power Company was given. This company is composed of Dayton, Ohio, capitalists, and has, it is said, $2,000,000 behind it.

A bill has been introduced in the Massachusetts legislature to empower cities and towns to make and distribute electricity for light, heat and motive power.

Advantages of Direct Connected Direct Current Generators.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, MILWAUKEE, JANUARY 17, BY W. N. STEWART.

The members of the association who were present at the last convention at Madison undoubtedly remember that the speaker was somewhat pronounced in his advocacy of direct current apparatus for central station lighting in towns such as exist most commonly in the Northwest; for this reason he probably owes the request from our worthy secretary to prepare a paper to be read at this meeting on the advantages of direct connected direct current apparatus.

While I hope to present strong reasons for the faith that is in me, it should not be understood that the alternating systems are to be condemned in all cases. For transmission of light or power to long distances, some form of alternating or multiphase current apparatus may be employed to advantage. The same is true when lights are scattered over extended areas. What I propose to speak of to-day will solely refer to electrical work over the areas not to exceed three miles in any direction from the power house, under the average conditions of the average Northwestern city of not to exceed 35,000 inhabitants; where streets are to be lighted with arc lamps, and stores and residences with either arc or incandescent lamps, as preferred, motive power being furnished where a demand for the same exists; current to be furnished 24 hours daily to all customers.

Permit me to describe what I should consider a model plant of 500 horse-power, the sizes of machinery, etc., being proportionately increased or decreased for a larger or smaller installation. I shall describe electrical details only, as local conditions govern as to class of power plant, only presuming that steam power is used. For water power the arrangements would be the same, except that in most cases one belt would be necessary for each generator.

For the generating plant the following apparatus would be installed:

One multipolar generator of 100 horse-power, running at about 250 revolutions per minute, directly connected to a compound engine of the same speed.

One multipolar generator of 400 horse-power, running at about 170 revolutions per minute, directly connected to a compound engine of the same speed.

In most cases condensing apparatus is to be used where water is available.

These dynamos are to be made for 220 volts if three wire system is used, and for 480 volts if five wire system is employed; three wire distribution to be employed where the distances are not over one mile from the power house, and five wire where they exceed one mile.

Additional apparatus as follows would be necessary:

For three wire system, 120 cells of storage battery, each cell having a capacity of 30 amperes for 15 hours; for five wire system, 240 cells of battery, same size. This storage plant to be used as an equalizer and regulator, and to furnish current during the day.

Necessary switch board apparatus, including an automatic regulator for dynamos, would also be necessary.

The wiring would be as follows:

One circuit of mains and feeders for commercial and house lighting. This would supply all private consumers with arc or incandescent lighting or motive power—each customer to have a meter. All meters to be connected to the outside wires of either three or five wire system.

To operate this plant we would employ but two men—one engineer and one fireman. The station would have a superintendent and lamp trimmers as necessary for the number of arc lamps used.

The public arc lamps would be wired as follows:

If three wire system is used, a common neutral wire would be supplied for both public and private lights; this neutral being thoroughly grounded at various points. Thus but two wires would be run for the public lighting—the arc lamps being connected in groups of two between the positive and neutral. If the five wire system is used, the arc lamps would be run in groups of eight, each lamp having an automatic cut-out. To run arc lamps on a constant potential circuit, it is necessary to have a certain amount of resistance in the circuit to steady the arc; this resistance should be in the line wire, iron wire being used in some cases, or copper wire not smaller than No. 8.

But my technical friends will immediately say: "This resistance is a waste of power, and therefore to be avoided." True, according to the usual theories, but electrical lighting is in its infancy, although we must admit that it is a very robust infant. It is but a few years ago that the English electricians denied Mr. Edison's statement that he had attained the practical subdivision of the electric light, and the pathway of electrical development is strewn with the wrecks of exploded theories. Let us see if this loss in resistance is not a pebble over which electricians have stumbled, thinking it a mountain.

In the last edition of Prof. Sylvanus Thompson's "Dynamo Electric Machinery," a standard authority, he gives the efficiency of the best arc dynamo of the constant current type at 78 per cent. A few pages further on he mentions constant potential dynamos having an efficiency of 95 per cent. or more. His arc machine will not maintain its entire efficiency for any length of time, and its insulation constantly carbonizes and runs down. Here, then, we have something very practical to start on. If the ordinary arc dynamo gives 78 per cent. efficiency, and the constant potential machine 95 per cent., we have a difference of 17 per cent. in favor of the constant potential machine. The resistance necessary to work the low tension arc lamps never exceeds 15 per cent. of the current, so that we have an advantage of 20 per cent. in favor of the system which I am describing.

But we have still another gain. The ordinary arc dynamo runs at about 900 revolutions per minute, and must therefore be belted to the engine. The friction of this belting and high speed dynamo must be taken into consideration. If one belt direct from engine is used, 10 per cent. is lost; if a countershaft is used, 18 per cent. is lost. So that is one case where we gain 12 per cent. in one power bill, and in the other 20 per cent. And this is not theory. It is being done every day in the State of Wisconsin and adjoining States.

It may be said here, in passing, that the arc lamps used on this system can be had of any candle power from 600 to 12,000, so that the light can be distributed through a city in any desired manner. Also, these lamps burn as steadily as any incandescent lamp; are closed to prevent the entrance of dust, snow or insects, and throw but little shadow underneath.

The operation of such a station would be as follows:

The small dynamo would be started no later than four o'clock in the afternoon; most of its current being absorbed by the storage battery as darkness approaches, the large dynamo would be started, its current being divided between the customers, streets and storage battery, until all the lights are burning, when the battery would simply act as a regulator. This engine would run steadily until 2 o'clock in the morning, the last four hours being principally devoted to charging the battery.

Thus the employés would have a daily run of 10 hours, and the engines would always work at maximum efficiency for the full run. The battery would do the work 14 hours daily. It may be well to state here that storage batteries are now being used in most European stations, and in three or four of the largest American stations with good results, and that batteries can be had which infringe no patents, and which are thoroughly reliable in their action.

We have a station which is made up as follows:

One machine in operation at one time, doing all our work; that machine having an efficiency of 95 per cent. with no losses in belting or shafting, running at slow speed with consequent minimum of cost for repairs.

A daily run of only 10 hours, thus getting the best possible service from employés.

Current available day and night for all persons.

A machine which does not burn out and which can be repaired in three hours.

Low pressure wiring, therefore no damage suits for loss of life.

Longer life and less blackening of incandescent lamps, as the battery gives a current absolutely uniform at all times.

Less real estate and buildings required.

Less liability to breakdowns.

No burned out armatures. The average cost of burned-out armatures on arc machines in 77 cities was, last year, $2.14 per arc lamp.

Less oil; fewer employés; no losses in transformers, or other subsidiary apparatus.

What is economy? It might startle you to say it would be 40 per cent. per annum over old-fashioned methods, but this is being done every day. The Committee on Direct Connected Generators of the American Street Railway Association reported at the convention recently held in this city, that an electric railway could afford to throw its machinery into the scrap heap, increase the interest account 15 per cent., and yet be 25 per cent. per annum the gainer. The results are even more favorable in lighting when a storage battery is used.

The chief electrical engineer of the World's Fair reported in favor of direct connected generators, and one machine for arc and incandescent lights and power. All through the country the largest concerns are throwing out the high speed belted apparatus, and not for reasons of mere sentiment, but because it pays.

It pays because the modern slow speed multipolar generator is as near perfection as can ever be attained, and because its high initial efficiency is maintained for many years. This is not true with the older type of high speed machines, on account of the too literal use of carbonizable insulation and lack of radiating surface. The multipolar dynamo as now made has an armature winding of solid copper bars, largely exposed directly to the air, and of minimum internal resistance. Mica is largely used for insulation, and only about 20 per cent. of the total current is used to excite the fields. Recent investigations have shown the annual wear and tear of belting to be 37 per cent. of the first cost, and the annual number of interruptions to service from its use to be five. In the Chicago Auditorium, official figures show an annual economy of $46,500 on a plant of 17,000 incandescent lights in favor of the direct connected machines. Equally favorable results are reported from many other places. Incandescent lights are being furnished in the City of Chicago to-day for less than one-half cent per hour, and good profits realized. In the City of New York the arc light companies charge 40 cents per night for one lamp of 2,000 candles. The Edison Company furnishes two lamps of 1,200 candles each for 50 cents per night from a low pressure circuit, although cost of carbons, trimming and interest on investment is much greater. Arc lamps of 1,200 candles burning all night every night in the year are being furnished in the State of Wisconsin for $50 per year from low pressure circuits, and with profits to the owners of the plant.

In this connection it should be remembered that if a large upper cored carbon and a small lower solid carbon are used, that 50 per cent. more light is obtained (according to Professor Carhart, of Michigan University) than with the ordinary carbons. Thus, a six ampere lamp is practically as good as a nine ampere lamp. These carbons cost more, but the fuel consumption is less and the net result is a large saving.

Can the existing stations be rebuilt without too great sacrifice? In most cases, yes. Engines, boilers and power plant can usually be utilized; poles need not be changed; wire can all be used; old dynamos and arc lamps can be sold for 25 per cent. of first cost. Therefore, no reason exists why any manager should persist in using obsolete methods.

In conclusion, I thank you for your kindness in giving me so attentive a hearing, and assure you that I have carefully tried to confine myself to facts as observed by me in this country and Europe; to reiterate my belief founded on 23 years' work in the electrical business, that it is the direct current stations which are paying the dividends; and to invite any of those interested to visit some of the modern plants working on the system which I have outlined.

Another Incandescent Lamp.

In order to cheapen the manufacture of the incandescent lamp it becomes necessary to effect a radical departure in the method of manufacture. The parts which now exist in the incandescent bulb, and which are thoroughly essential to illumination, comprise a glass covering containing a filament of carbon in a vacuum, and being arranged in a manner so as to accommodate the entrance and exit of the flow of current, either continuous or alternating.

A new lamp will shortly make its appearance, and the inventor, by a careful series of experiments, the results of which have not heretofore been made public, obtained a seal or stopper, as he chooses to call it, which effectually prevents the admission of air into the vacuum chamber. The unique part of this lamp consists in the fact that but one operation is necessary to form the base or cap of the lamp, secure the central glass tube in place, which in turn holds the leading-in wires and to make perfect connections with the leading-in wires, the lamp, of course, being evacuated and sealed by different processes as the manufacturer sees fit.

A mold is provided which may be compared to a cartridge mold, from which is obtained a casting whose external shape is either the Edison, Westinghouse, Thomson-Houston, or any other base that may be desired. The glass bulb is set into this mold after the central glass tube containing the leading-in wires has been placed in the center of the lamp. One of the leading-in wires passes directly through this glass tube, the other passes through a hole in this central tube, the two leading-in wires being respectively surrounded by the fusible metal cap as soon as the metal is poured around the bottom of the globe. The outside globe, the central tube and the mold are all brought up to a temperature of about 500 degrees Fahrenheit. The metal is then poured in. The melting point of the fusible metal is in the neighborhood of 400 degrees Fahrenheit. The inventor of this new stopper declares that the fusible metal has exactly the same co-efficient of expansion as that of glass, so that if a drop of it be allowed to fall upon a heated glass plate the contact is so perfect that only with the greatest difficulty can the metal and glass be separated.

It will thus be seen that the above mentioned operations may be performed at once. In order to renew lamps, the carbons of which have become either broken or burned out, it is simply necessary to bring the lamp to a temperature of that of the melting point of the metal. The central tube may thus be easily separated and new carbons inserted.

The inventor declares that this lamp can be manufactured at a price much less than that of any other lamp now on the market. He claims that the metal will hold the vacuum perfectly, but whether this is an assured fact or not remains to be seen from actual practice.

It is expected that a company will be formed to place the lamps on the market, but it has not been decided whether they will simply license companies whose works are now in existence or whether they will manufacture the lamp themselves. Pushing men are at the head of it, and the promoters expect a great deal.

The lamp situation at the present moment is in such a complicated condition that no one is able to foresee results in any case, but it will be found out in the long run that the best lamp will be the one which will be retained in popular favor.

Captain E. L. Zalinski, U. S. A.

Captain Zalinski, of the United States Army, is widely known in electrical and scientific circles. His work with the dynamite gun has given him a world-wide fame. Recently the Captain came to New York on sick leave and is now residing here.

A friend of his who is acquainted with all the details of the negotiations entered into by the Brazilian government to secure Captain Zalinski's services in handling the dynamite gun, and about which so much that is not correct has been published, was recently interviewed by an ELECTRICAL REVIEW representative, and said:

"Captain Zalinski received a telegram while at the Presidio, San Francisco, asking him to go to Brazil with a pneumatic gun. He answered that he would not go for combat, but that he was willing to organize and train gun crews, and try to arrange everything for successful use of the gun. The Captain was requested to come to New York and did so, and found a great deal to do in getting guns ready and did all he could of it.

"Captain Zalinski would have liked to have gone on the trip and fight the gun from professional interest and to show practically its possibilities from a floating platform. These he has always contended were greater than usually conceded, and a practical demonstration would have been a source of great professional satisfaction. Such demonstration, however, would have meant the destruction of hundreds of lives, and this the Captain was not prepared to contemplate as a mercenary object, and professional interest alone would not justify him in a course in which he had no direct interest.

"The Captain did desire, however, to go with the ship as far as the West Indies, in order to aid in perfecting arrangements and to have some target practice at sea. There were several ways in which he hoped to overcome the difficulties due to the unstable platform, and experience alone, in handling the gun at sea, would show which of these methods were most practicable. It is a source of much regret to the Captain that he was not able to secure permission from the War Department to utilize this opportunity."

The above is interesting and may be taken as an authoritative statement of Captain Zalinski's position. He was about this time ordered before the Retiring Board, and was found incapacitated for active duty in the field because of lameness, but the board recommended that, in view of value of past services and the work he was now doing and capable of doing, he be given an indefinite sick leave, instead of being retired. Mr. Jarvis B. Edson, of this city, is a close friend of Captain Zalinski, and strongly opposed his retirement, and was largely instrumental in preventing it. While Captain Zalinski cannot dance the german or turn out at dress parade, he could at once take the field in the saddle.

Northwestern Electrical Association.

PROCEEDINGS IN DETAIL OF THE MILWAUKEE CONVENTION.

The annual meeting of the Northwestern Electrical Association was held at the Hotel Pfister, Milwaukee, on January 17, 18, 19. The large attendance included over 30 central station men, and a warm interest in the various subjects under discussion and in the future welfare of the association was manifested at every session. Mr. Paige is an excellent presiding officer, and his adjutant, Secretary Thom, enthuses all with whom he comes in contact.

President Collins called the association to order at the first session, beginning at 4 o'clock, Wednesday afternoon, and introduced Mayor Koch, who welcomed the members. Ex-Senator Merrill, of Ashland, responded briefly. On motion of Mr. Merrill, Mayor Koch was made an honorary member of the association.

Routine business was then taken up, some 30 new members were received into the association, the election of officers for the ensuing year occurred, a vote of thanks tendered to the retiring officers and the meeting adjourned until evening. The following gentlemen were elected to office for the ensuing year: President, C. C. Paige, Oshkosh; first vice-president, W. B. Baker, Waupaca; second vice-president, E. L. Debell, Sheboygan; secretary H. C. Thom, Madison; treasurer, George F. Merrill, Ashland; directors, William Goetz, Milwaukee; Pliny Norcross, Janesville; John Schuette, Manitowoc.

At the evening session Mr. W. N. Stewart, of the Siemens & Halske Electric Company, read a paper on the "Advantages of Direct Connection," describing his idea of a model central station, his plans being based on the methods employed in several European cities. Mr. Stewart stated that incandescent lights are now furnished in this City of Chicago for less than one-half cent per hour, and good profits realized. In the City of New York the arc light companies charge 40 cents per night for one lamp of 2,000 candles, while the Edison company furnish two lights of 1,200 candle-power each for 50 cents per night, from a low pressure system, although the cost of carbons, trimming, and the interest on the investment is greater than for the former.

It is a question just how serviceable statements of this character are to central station men, unless accompanied by details, showing conditions under which the low prices mentioned can be maintained. The usual price per lamp hour is one cent for a sixteen candle-power light, and the average station will make little profit, if selling at a lower rate, Mr. Stewart's statements to the contrary notwithstanding. It is easy to say that it costs but two cents to produce an arc lamp hour, and but 2½ mills an incandescent lamp hour, but in how many stations in this country can it be practically demonstrated?

Prof. D. C. Jackson, of the Wisconsin University, read an interesting paper on "Essential Station Instruments" that is worthy of careful perusal. It was published in full in the ELECTRICAL REVIEW last week.

THURSDAY'S PROCEEDINGS.

President Paige called the members to order at 10 o'clock, and a ballot was then taken, resulting in the selection of St. Paul as the city in which the semi-annual meeting would be held on the third Wednesday in July. Of the 27 members voting, 20 favored the city named.

Mr. Will. W. Low, president of the Electrical Appliance Company, Chicago, then read a brief paper on "The New Things in Electricity," holding that from the central station man's point of view the very complete catalogues and discount sheets, together with the salesmen possessing consciences, are the best among the new things in the supply business. As all but one of the supply men present—a gloomy individual answering to the name of Bunce—claimed to have a conscience, the paper was not discussed.

Mr. W. Forman Collins followed with a thoughtfully prepared paper on the "Economical Use of Transformers," published in full in the ELECTRICAL REVIEW last week.

Mr. Parmalee J. McFadden, of the staff of the General Electric Company, followed with some very interesting practical details, so clearly and concisely presented that little was left for discussion. His remarks appear elsewhere in full.

Following the opening of the discussion, Mr. John Schuette, the well-known banker of Manitowoc, related his experience in dealing with the question of transformation of currents, and as his remarks are always of a practical character they were listened to with interest. He believed that the only point to consider was how to get the best results from the equipment now comprised in our plants. Mr. E. L. Debell, of Sheboygan, believed that for business houses where the load seldom varied the individual transformer is the more economical, but for residences the best results are secured by using large units. The European practice of employing a bank of transformers was referred to; a suggestion made that inventors be asked to produce a practical device that would automatically cut out a single transformer when not in service, and prevent the loss following the employment of many transformers after midnight. Then the relative merits of the five-wire direct-current system *versus* transformers were discussed, Mr. W. N. Stewart leading in favor of the method comparatively new in this country, but which his employer, the Siemens Halske Electric Company, employs in several of its European stations. Mr. Stewart maintained that there was scarcely a town represented in this association standing in need of a transformer system; that the price of copper was no longer the bugbear to be dreaded, and that the limited area covered by the present circuits would, in many cases, render it a profitable investment, were the present systems displaced by the five-wire. Mr. Stewart asked the very pertinent question, why the General Electric Company had not brought out and developed the merits of the five-wire system they owned, and which was an extension of the three-wire system; "Five wires can be installed more cheaply than transformers." Then followed a ploughing up of the old danger field, and many hypothetical cases of death following the handling of lamp sockets on alternating current circuits were referred to. W. Forman Collins and Mr. McFadden explained how almost impossible was the likelihood of the primary current passing in on the secondary mains, as the secondary coil would burn out if the secondary fuse did not blow, which it had always been known to do. Mr. George Mayo thought that if there was the slightest danger to life in handling lamp sockets on alternating circuits, it certainly would have been manifested long ago, for there were several hundred thousand such lamps in service. Mr. Bedell referred to an accident resulting in a severe shock and burn, but admitted that the transformer was not of an improved type, but had a wooden base on which moisture often collected. Mr. McFadden explained the facts in the Peoria incident, wherein a defective socket and a grounding of the primary current caused serious trouble, but admitted that it was a very rare occurrence. Mr. W. H. Thorpe suggested methods for overcoming some of the difficulties mentioned. Mr. Tommy Grier stated that it was his practice to install transformers on a basis of an overload of 33⅓ per cent., and that this method had proved satisfactory. Mr. P. H. Korst concisely referred to the practice in several stations, and Prof. D. C. Jackson stated that some of the troubles referred to might have been prevented had attention been paid to well-known laws of engineering, the transgression of which always reacts unpleasantly on both pocket and physical comfort; that, usually, the better plan to follow when contemplating changes would be to call in engineering talent in each special branch of electrical work. And these remarks were heartily endorsed.

Secretary Thom then referred to the banquet to be held in the evening, and announced that Mr. S. F. B. Morse had very kindly offered to supply all the champagne desired at the banquet. The offer was accepted with thanks, and it may be added here that at the banquet Mr. Morse was referred to as a "jolly good fellow." The same appellation was also given to Mr. A. C. Bunce, who kindly supplied the cigars for the occasion, and to the representative of the A. W. Harris Oil Company, who supplied the boutonnieres. The meeting was then adjourned.

AFTERNOON SESSION.

At 2:30 P. M. the members again assembled and remained in session until 6 P. M. Following the call to order Mr. E. L. Debell, of Sheboygan, read an interesting paper on "Corliss Compound Engines for Electric Light Work," which is published on another page in full. Mr. Schuette briefly referred to the remarkable saving effected in his mills by using improved machinery. This paper deserved extended discussion, and it must have been a source of regret to some of the members that the engine men in Milwaukee—where four different firms manufacture Corliss engines—neither participated in the discussion, nor so far as is known attended the meeting.

Mr. H. C. Thom, of Madison, then stated that he had intended to prepare a paper on the subject, "How Shall Members Buy Supplies?" but, with the permission of the president he would read two letters he had received and then follow with a paper entitled "The Trend of Electrical Investment," which will be found in full on another page. The writer of the letters coincided with some of the arguments presented in a paper read by Mr. Thom at a previous meeting, and suggested certain changes in existing methods if the central station men did not want to learn how to become receivers.

Hardly had Mr. Thom ceased speaking when a discussion began that lasted for two hours. Mr. W. F. Collins believed that the real blame for having non-paying plants rests on the men who endeavored to save the cost of the services of a competent consulting engineer, and that in some cases it might prove profitable to employ an experienced electrical engineer to overhaul the entire plant and place it on a paying basis. Mr. Norcross believed that only business principles should prevail in this, the crowning industry of the future; then there would be no non-paying lighting plants. Mr. Stewart referred to the fallacy of cutting rates. Senator Merrill referred to the lack of knowledge regarding the cost of an horse-power hour; Prof. Jackson suggested the wisdom of first determining what the current costs at the dynamo or the switch board. Then the discussion drifted off into the keeping of station accounts and the proper rate to charge for arc and for incandescent lighting, and on motion, Prof. Jackson was requested to prepare a paper on "The Best Methods of Keeping Central Station Accounts." This Prof. Jackson promised to do, provided the members would send to him copies of the forms now used and such data as would assist in the preparation of the paper. And right here the writer will make the suggestion that it would materially add to the value of Prof. Jackson's paper if every central station manager, in any part of the country, who may read this summary of proceedings, would send a set of forms, and any suggestions that would aid in formulating a standard system, to Prof. D. C. Jackson, Madison, Wis. Mr. John Schuette made an observation in his quaint, attractive way, to the effect that his superintendent files a daily report at the bank, and at the end of each six months Mr. Schuette declares the dividends and *divides the surplus profits* among the stockholders. The appointment of a committee to recommend a schedule of prices for arc and incandescent lights was discussed and on motion carried.

The following committees were then announced: Committee on Legislation: H. C. Thom, Geo. Merrill, George Grimm; Committee on Transportation: I. P. Lord, Pliny Norcross, O. M. Race; Committee on Entertainment: J. C. Woodward, W. B. Baker, L. E. Debell; Committee on Special Legislation for Underwriters' Rules: H. C. Thom, Pliny Norcross, J. A. Andrews; Committee for Preparing Rate Schedule: Geo. A. Davis, George Farwell, P. H. Korst. Several new members were added, the business closed up and an adjournment carried.

THE BANQUET.

The members and friends, to the number of nearly 100, marched into the banquet room at 8:30, and listened to the opening remarks of that admirable toastmaker, Mr. W. H. Thom. The first toast on the programme, "Damage Suits," was responded to by Senator Merrill, of Ashland, who intimated that the desire to secure damages for every ill, or for every imaginary grievance, was a form of disease fostered by philanthropic lawyers; a disease that will reduce a full pocket-book, knock out dividends and bring a receiver to the door. The next speaker, Mr. A. C. Bunce, was introduced by Mr. Thom as one who, not being gifted with conversational powers, would converse on the subject of "The Supply Man," with the aid of his fingers. Mr. Bunce's remarks to the effect that the supply man was a missionary going about doing good, dispelling darkness and shedding the glory of the light—at so much an ampere hour—were well received. Mr. W. N. Stewart, introduced as a gentleman representing a 15-wire system, told a story about some unfortunate investors who, becoming weary of life, were questioned by St. Peter, relative to the system they had adopted while on earth. Then Mr. Marcein followed with a response to the toast "Currents." In his experience the wisest and best manner of handling currents of 1,000 volts and upward was to let the other fellow do it. He thought it a grand object in life to manage a central station, for then one need only repeat the command that has rolled down to us from the beginning of time, "Let there be light!" and if the bills are paid, and the shafting in line, and the engines in order, and the armature not burned out, and the carbons feed properly, then there may be light. He also paid his compliments to that other kind of fruit, the soft, elusive, caressing battery current, likening it to your best girl, so constant at times, and so unsatisfactory at others. The members then listened to a solo, "It Was On Monday Morning," following which Col. R. C. Spencer replied to the "Commercial Aspect of the Electrical Business," stating that in his opinion the education of the people to a better appreciation of how thoroughly every effort is being put forth by central station managers to offer the best service a plant is capable of affording, is the secret of commercial success. Mr. H. C. Underwood talked on "Electricity at Ohm, Sweet Ohm and Abroad." He wittily referred to his connection with the electrical interests, and told of two inventors who recently came to his office, one having a device to be placed in a coffin, whereby a buried person, waking to the conclusion that he was the right man in the wrong place, could instantly communicate to his friends his desire for more comfortable apartments, told several good stories, and presented a little German sketch so admirably as to win continued applause. To the toast "A New World," Col. James S. Flanders responded with some brilliant remarks, in which he referred to the brief history of the past, the boundless possibilities of the future, and his belief that those who now stand at the head of the electrical profession may be as babes in knowledge when compared with those who will lead the coming generation; and that success will come most quickly to him who pins his faith on the high principles actuating the leaders in any profession. Mr. Thom made a few appropriate closing remarks, and the members then adjourned to the club room, where they passed the next two or three hours in making merry.

On Friday the members and their friends were the guests of the local committee and visited the new and model shops of the Milwaukee Street Railway Company, the power house of the E. P. Allis Company, the Pabst Brewing Company, the Edison, the Siemens & Halske and the Badger local stations.

From the beginning it was a very enjoyable affair, and every one, especially the active supply men, were tireless in their endeavors to promote the best interests of all, and the bonds of good fellowship were closely united among the different interests represented.

FRED. DE LAND.

American Institute of Electrical Engineers.

At the meeting of council held January 17, the following associate members were elected:

Comfort A. Adams, Jr., instructor in electrical engineering, Harvard University, 21 Stoughton Hall, Cambridge, Mass.

U. N. Bethell, acting general manager, The Metropolitan Telephone and Telegraph Company, 18 Cortlandt street, New York city.

Francis Broadnox, engineer, Safety Insulated Wire and Cable Company, 50 Broadway, New York city.

Joseph Broich, superintendent and electrician with F. Pearce, 448 Eighth avenue, Brooklyn, N. Y.

Sigfried H. Ende, Colonnade Hotel, 39 Lafayette place, New York city.

Thomas Francis Flanagan, superintendent and electrician, Portsmouth Gas Light Company, Portsmouth, N. H.

Bertram P. Flint, electrical and mechanical engineer with Charles H. Davis, 120 Broadway, New York city.

James Mason Knox, student in electrical engineering, Columbia College School of Mines, New York city.

Wynn Meredith, assistant superintendent, operating electrical department Midwinter Fair, San Francisco, Cal.

Max Osterberg, student in electrical engineering, Columbia College, 232 East Sixty-second street, New York city.

R. L. Selden, Jr., Deep River, Conn.

George F. Sever, instructor in electrical engineering, Columbia College, 121 East Thirtieth street, New York city.

Charles Henry Smith, assistant electrician, Southeastern Tariff Association, Atlanta, Ga.

Sidney Sprout, electrical department, Midwinter Fair, San Francisco, Cal.

George A. Wardlow, assistant engineer, People's Light and Power Company, Doolittle House, Oswego, N. Y.

The following associate members were transferred to full membership:

W. L. R. Emmet, electrical engineer, General Electric Company, New York city.

Nathaniel S. Keith, electrical engineer, San Francisco, Cal.

Alton D. Adams, Worcester, Mass.

C. E. McCluer, superintendent first district, Southern Bell Telephone and Telegraph Company, Richmond, Va.

J. P. Jackson, assistant professor of electrical engineering, Pennsylvania State College, State College, Pa.

Railroad Rates to the Washington Electric Light Convention.

Master of Transportation C. O. Baker, Jr., announces that the Boston Passenger Committee and the Southern Passenger Association have granted a rate of a fare and a third for the round trip from points in their respective territories to members and delegates attending the Washington convention.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Electric Light and Power.

ST. CHARLES, MO.—Albert Spiers, in company with several St. Louis gentlemen, will probably secure the franchise for an incandescent light plant at this place.

NEWARK, N. J.—The People's Light and Power Company; capital, $2,000,000. Its object is to furnish and distribute electricity, steam and gas for light, heat and power in Newark, Orange, East Orange, Bloomfield, Montclair, Harrison, Kearney and Jersey City. It will also purchase, sell and lease plants and make contracts with private parties or corporations. Business is to be conducted with $100,000, divided into 4,000 shares of the par value of $25 each. The incorporators are James K. Corbiere, Joseph L. Munn, James E. Reynolds, Elisha B. Gaddis and Thomas A. Nevins.

BALTIMORE, MD.—The Baltimore and Ohio Railroad Company is said to be back of the scheme to operate the Chesapeake and Ohio Canal by electricity. Charles K. Lord, third vice-president of the Baltimore and Ohio, is one of the incorporators of the new company. By the trolley system on the canal the Baltimore and Ohio hope to haul coal from Cumberland to Georgetown, D. C., cheaper than by rail, and relieve the railroad of much heavy traffic. Should the trolley not prove successful, the Baltimore and Ohio will secure the bed of the canal for a roadway, thus avoiding the heavy grades between here and Cumberland. An officer of the company says the plans for introducing the trolley on the canal have been settled, but work will not begin until the question of the tariff on coal is settled.

HEALDSBURG, CAL.—The Healdsburg Electric Light and Power Company; capital, $25,000.

New Electric Railways.

HOMESTEAD, PA.—The Braddock and Homestead Electric Street Railway Company, capital, $7,500, has been chartered to build a line one and a half miles long. The directors are C. Jutte, F. K. Morse, C. M. Buchanan and George W. Theis.

SLATINGTON, PA.—The Slatington Street Railway Company, capital, $30,000. President, R. W. Mosteller, Slatington; directors, Henry Buttner, John W. Balliet, H. W. Hanker, Slatington; Morris Hoats, Allentown.

PHILADELPHIA, PA.—Colonel E. de V. Morrell, of Philadelphia, has obtained franchises for the right of way for an electric railway to connect Trenton with Philadelphia by way of Bristol. This in connection with the construction of the electric road between Jersey City and Trenton, which was contracted for last week, will form a continuous line of electric railways between the great cities of New York and Philadelphia, and open up an entire new section of country.

BALTIMORE, Md.—The Baltimore and Anne Arundel Electric Railway Company; capital, $50,000, with permission to increase to $500,000. The road is to start from Baltimore and go through the fourth and fifth election districts of Anne Arundel county, with the right to extend its branches 10 miles in any direction. The upper terminus of the line will be at Laurel, Prince George's county.

New Manufacturing Companies.

BROOKLYN, N. Y.—C. & P. Manufacturing Company, of Brooklyn, to manufacture and sell machinery and appliances, electrical, steam or otherwise, owned or

IMPROVED REFLECTORS OF THE E. P. GLEASON COMPANY, NEW YORK.

controlled by Alex. Churchward and William D. Perry; capital, $20,000, and directors, Marshall T. Davidson, Joseph F. Scholes, Harris B. Starkey, William D. Perry and William A. Drewett, Brooklyn.

Gleason's Standard Silvered Glass Reflectors.

The E. P. Gleason Manufacturing Company, 181 Mercer street, who are constantly adding to their already large line of appliances for electric lighting are now in the market with new styles of silvered reflectors, as shown in the accompanying cuts. They are made in shapes of the staple electric shades, radial fluted and spiral corrugated, richly silvered inside, enameled green outside, greatly increasing the candle power of electric lamps. The reflectors are always bright, cannot tarnish and are easily cleaned. The crowning feature is the price. They are claimed to be the cheapest and simplest reflectors ever put on the market.

Securities that Were Sold by the General Electric Company.

Readers of the ELECTRICAL REVIEW are more or less familiar with the plan which was arranged to fund the $4,250,000 floating debt of the General Electric Company. It will be remembered that twelve million odd, par value, of securities were turned over to a trust called the Railway and Illuminating Properties, which supplied the cash in lieu therefor, and whi proposes, when the times are advantageous, to reimburse itself by selling these securities.

Following is given a list of the securities turned over:

Bonds.	Par.
United Electric Securities Co., Boston	$337,000
East River Electric Light Co., New York	325,000
Electric Lighting & Power Co., Syracuse, N. Y.	314,000
Milwaukee Street Railway Co.	300,000
Edison Illuminating Co., St. Louis	300,000
Tacoma Railway & Motor Co.	200,000
Queen City Railway Co., Dallas, Texas	192,000
Atlanta Consolidated Street Railway Co.	188,000
Toledo Electric Co., Ohio	160,000
Chicago North Shore Railway	150,000
Charleston Lighting & Power Co., South Carolina	150,000
Maryland Electric Co., Baltimore	150,000
Cleveland General Electric Co., Ohio	115,000
Cicero & Proviso Street Railway Co., Chicago	115,000
Dayton Electric Lighting Co., Ohio	100,000
Citizens' General Electric Co., Louisiana, Ky	100,000
Louisiana Electric Lighting Co., New Orleans	100,000
Tarrytown & Irvington Union Gas Lighting Co.	80,000
Portland General Electric Co., Oregon	77,000
Binghamton General Electric Co., N. Y.	50,000
Scranton Illuminating Heat & Power Co., Pennsylvania	40,000
Concord Land & Water Power Co., New Hampshire	30,000
Twenty-two companies	$3,573,000
Miscellaneous bonds represented by forty different properties	1,027,500
Total	$4,600,500
STOCKS.	
Buffalo General Electric Co.	$250,000
Cumberland Light & Power Co., Nashville	250,000
Manhattan Electric Light Co., New York	230,000
Portland General Electric Co.	200,000
North River Electric Light & Power Co.	177,666
Cleveland General Electric Co.	150,000
Binghamton General Electric Co.	100,000
Chicago Edison Co.	100,000
Electric Corporation	500,000
Dayton Electric Light Co.	310,000
Electric Light & Power Co., Syracuse	95,000
Edison Electric Illuminating Co., Paterson, N. J.	75,000
Edison Electric Illuminating Co., Detroit	54,375
Indianapolis Light & Power Co.	50,000
Edison Electric Illuminating Co., Boston	25,000
Edison Electric Illuminating Co., N. Y.	20,000
Sixteen companies	$2,892,541
Miscellaneous stocks represented by 35 different properties	2,471,570
Total	$5,364,111
Bonds	$4,600,500
Stocks	5,364,111
Miscellaneous notes, obligations and properties	2,323,821
Total interest in 129 different properties	$12,288,433

These securities taken out of the list of the General Electric present assets make the value of the securities remaining an important problem to determine. There have been so many changes in the company's balance sheet since the last annual report a year ago, that only those most familiar with the property and identified with it can give a correct list of present assets. These are held from publication at present. It is known that a few of the assets left have shrunk very much in value.

Power From Niagara Falls.

The first practical test of the great hydraulic tunnel, which has been under construction at Niagara Falls, N. Y., for the past three years, was made at 11 o'clock A. M. on January 25.

When the gates were raised at the entrance to the feeder leading from the big hydraulic canal to the wheel pit of the Niagara Falls Paper Company's mill, the waters of the upper river rushed through their newly found channel to the wheelhouse, where they poured down the penstock of the pit, a huge iron structure 13 feet in diameter, for a distance of 155 feet, then striking three of the largest turbine wheels ever built, and thence passing into the big tunnel and flowing out under the city to the river below the falls, nearly two miles distant from the point of the fall. The paper mill, which is the first to get the benefit of the power, is the largest of its kind in the world. Its contract calls for 6,600 horse-power, one-half of which is being used now, and the cost, including the lease of the land occupied by the mill, is $8 per horse-power per year for 24 hours a day, the cheapest, it is said, ever obtained. The test proved a satisfactory one, and the mill is now in full operation. The hydraulic tunnel, with a capacity of 120,000 horse-power, is a success, and now there remains only the opening of the general power house, where 5,000 horse-power turbines will operate 5,000 horse-power electric generators for the transmission of power in this form.

This opening will take place on June 1, and it is intended to give the event a celebration, at which distinguished savants, engineers and State officials will be present.

The test on January 25 was made in the presence only of the officials of the paper mill and of the R. D. Wood Company, of Philadelphia, who built and placed the machinery in position, and Professor Geyelin, the designer of the turbines used. The first water drove one of the three turbines until one o'clock, then the second was turned on, and a third at two o'clock. The public was not acquainted with the fact until an hour later, owing to the desire of the company to make all possible allowances for newness of machinery, etc. Not a hitch was made, however, and everything ran as smoothly as it could be desired.

Counsel Fish's Opinion on Judge Ricks' Decision.

General Electric was sold down on Judge Ricks' decision that the Edison incandescent lamp patent expired November 10, 1893, when the English patent for the same invention expired. His decision holds it allows the public to manufacture incandescent lamps.

Counsel Fish, of the General Electric Company, informs a representative of the ELECTRICAL REVIEW that his company will appeal the case at once, and he does not believe that the Courts generally will sustain Judge Ricks. The Edison claim is that the British patent did not limit the American patent. Judge Shipman so decided two weeks ago in the Novak case.

Mr. Fish makes the following points:

In 1883 the Edison company, acting under a mistake and believing that their patent might possibly be invalid unless there was some reference to foreign patents on it, secured from the Commissioner of Patents a certificate of correction, which was appended to the patent, in which they referred to the foreign patents for the same invention, and stated in substance that the American patent was limited by those foreign patents in accordance with Section 4,887 of the Revised Statutes of the United States. By mistake the English patent was named with the other patent. The argument of the Buckeye company, which probably has been accepted by Judge Ricks, was that although the English patent did not in fact limit the term of the American patent, yet the Edison company was not allowed to say at the present time as against the Buckeye company, and in view of the special facts in their case, that its patent did not expire with the English patent, because of the fact that in 1883 this certificate of correction was put upon the patent. The certificate of correction was removed in the Spring of 1893.

Judge Shipman's decision was squarely to the effect that the English Edison patent had nothing to do with the term of the American patent, because it was not, in fact, a patent at all until after the grant of the American patent.

The point was raised before Judge Shipman on the motion to grant an injunction. He granted the injunction to restrain the Novak manufacture, despite the English patent. The question that was argued before Judge Ricks was not argued before Judge Shipman.

On the other hand, the question before Judge Shipman was conceded by the Buckeye company before Judge Ricks, namely, that the English patent had nothing to do in fact or law with the term of the American patent.

The defendants' argument, which probably was accepted by the court, was to the effect that although true the Edison company was estopped by its own conduct and by that certificate of 1883 from enforcing the American patent against the Buckeye company, it averred that there was special reasons why the patent, even if good against all the rest of the world, after the expiration of the English patent, was not good against them. Judge Ricks' decision probably affects only the Buckeye company and no other company.

The plant of the Whitehall, N. Y., Electric Light and Power Company was destroyed by fire on January 21. Loss $8,000; no insurance.

KINDRED INTERESTS

The Metropolitan Electric Company, Chicago, are having large sales of their new "Metropolitan" lamp. Practical men are reported as finding it to be thoroughly serviceable.

The New Works of the Stanley Electric Manufacturing Company, at Pittsfield, Mass., will be entirely of iron, designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn.

Chas. A. Schieren & Company, 45 to 51 Ferry street, New York, have issued a new catalogue of their perforated electric leather belting. The catalogue is entitled "Points on Perforated Electric Belting," and it contains many valuable suggestions to belt users.

The Consumers' Electrical Supply Company, 13 Park Row, New York city, have recently placed upon the market a new carbon for either high or low tension arc lamps. These "Cesco" carbons are reported to have proven most satisfactory in a series of comparative tests, and they have the additional advantage of being low in price. The carbons for incandescent circuits are coated with graphite, there being no binder at all, and, therefore, no foreign substance around the pure carbon. The graphite is applied to the carbon by what is commonly termed the "rumbling" process, barrels being filled with the carbons which constantly revolve, thus allowing the graphite to entirely cover the surface. This, of course, acts as a protective covering, increasing the life of the carbon. This is another of the "Cesco" specialties, which are rapidly gaining in popular favor.

The General Electric Company informs us that it has secured a large slice of the street railway car equipment contracts awarded during the last 10 days in Philadelphia. Of 250 contracted for by the People's Traction Company, 125 equipments with the G. E. 800 motors and Type K. controllers were purchased from the General Electric Company, while the remaining 125 were allotted to the Sperry Company, of Cleveland. Of 80 equipments required by the Electric Traction Company, of Philadelphia, 70 will be furnished by the General Electric Company. The People's Traction Company had already contracted for three of the great 1,500 kilowatts General Electric generators. The General Electric Company reports having secured contracts, during the past week, covering: Twenty car equipments for the Union Railroad, of New York; 25 car equipments and one 700 horse-power generator for the Steinway Railroad, of Long Island; eight M. P. 300 kilowatts generators for Cincinnati; and 10 car equipments for the St. Louis Street Railway Company.

An Important Arrangement was effected last week which is of interest to the electrical industry. It was the forming of a business alliance between the Standard Paint Company, manufacturers of the famous "P. & B." compounds, of New York, and the Metropolitan Electric Company, Mr. Wm. H. McKinlock, president, of Chicago, the latter concern arranging to handle the entire product of the first-named firm in the West. The Standard Paint Company's goods are so well established throughout the whole trade, and the Metropolitan's president enjoys a reputation for success that but few have attained, that it is hard for us to say just which of the two concerns should congratulate themselves the most. It seems the easiest way out of it for us to say that such an arrangement is the best thing for both concerns. It is unnecessary to predict that the "P. & B." specialties will reach a still larger degree of usefulness, and that the combination with the Metropolitan Electric Company as sole Western agents, will have no small share in the success which is sure to be attained.

ELECTRIC RAILWAY AND POWER NOTES.

St. Joseph capitalists propose to build an electric line from their town to South Bend, Ind.

A survey is being made for a trolley road from Reading, Pa., to Adamstown, 10 miles distant.

The Youngstown Park and Falls Electric Railway Company and the Youngstown, O., Electric Street Railway are to be consolidated.

The Cleveland and Berea, O., Street Railway Company is soon to be equipped with new cars, which will be operated on the trolley system.

The weather permitting, the Consolidated Traction Company will begin at once permanently to equip with electricity and relay the tracks of the leading horse-car lines in Newark, N. J.

L. M. Patterson, president of the Pennsylvania Traction Company, has officially announced that work on the new electric railway from Harrisburg to Philadelphia through this section of country will be commenced next Spring, and that all rights of way for the branch road from Parkesburg to Oxford have been secured.

It is authoritatively stated that the increase of traffic on the Thirteenth and Fifteenth Streets Passenger Railway Line in Philadelphia since the trolley cars were put in operation is 60 per cent. The Broad street 'buses and other lines of street cars running parallel with the Thirteenth and Fifteenth Streets Line have felt the competition.

At a meeting held by interested parties at Tiffin, O., recently, arrangements were perfected for the transfer of all the stock of the Tiffin Electric, Tiffin and Fostoria and Tiffin Street Railway Companies' lines to the Tiffin Interurban Consolidated Railway Company. Eastern capitalists will take up the bonds, and electric cars will run through from Tiffin to Fostoria by May 1.

The Commissioner of Labor of Missouri, Henry Blackmore, in his annual report on labor statistics and inspection, presents some interesting information concerning street railways. Twelve Missouri cities have made reports of street railway mileage, of which St. Louis has about one-half and Kansas City one fourth. The capital invested is $31,367,359, on which the earnings last year were $6,040,374. Over 4,000 men are employed by street railways in the entire State and the average yearly earnings of this class of workers is $601.83.

Another plan of union of the street railroad interests represented by the Brooklyn Heights Company, controlling the Brooklyn City, N. Y., Road, and what are known as the Broadway lines, whose management was recently merged into the Brooklyn, Queens County and Suburban Company, has been practically agreed upon since the previous negotiations were broken off last week. The new plan involves the purchase of $2,000,000 in bonds of the latter company by the former as a guarantee fund. The details of the consolidation of the two companies are not yet fully settled, but it is believed that there will be no further hitch.

GEORGE FORBES, F. R. S.,
Electrical Consulting Engineer,
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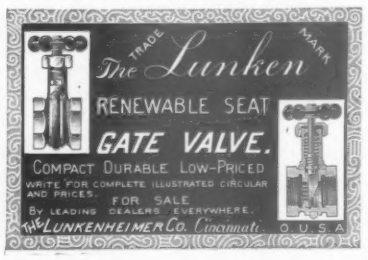

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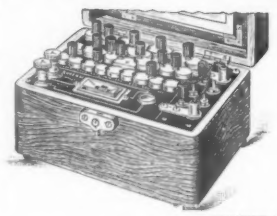

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